This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

NYPL RESEARCH LIBRARIES
3 3433 06636217 3

PRA

SYMONS'S

SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

VOLUME THE THIRTY-SECOND.

1897.

LONDON:
EDWARD STANFORD, COCKSPUR STREET, S.W.
1898.

THE NEW YORK
PUBLIC LIBRARY
200853
ASTOR, LENOX AND
TILDEN FOUNDATIONS.
R 1900. L

INDEX.

	PAGE
Abercromby, The Hon. Ralph	117
Air Currents, Inclined	188
Animals and Poultry killed in Storm of June 24th	87
April 27th Hailstorm in S. London	50
Arctic Regions, Kite Work in	34
August, 1897, Damage by Rain and Thunderstorms in..	124
August 4th, High Temperature in the night of	123
Australian and Indian Earthquakes, The Recent	92
Austrian Hydrography	155
Belgium, Meteorology in	91
Berwickshire, Winters in	93
British Association at Toronto	143
Buys-Ballot	119
Cape Colony, Heavy Rainfall at Port Elizabeth, May 5th, 1897	73
Casella, Louis Pascal	49
Climate of the British Empire, 1896	120
Climatological Tables for the British Empire...12, 28, 44, 60, 76, 96, 112, 128, 144, 160, 176, 192	
Colorado, A Tornado at Este's Park	9
Daily Weather Map, The first... 33, 133	
Dakota, Electric Trees in	27
Damage by Lightning..... 88, 124, 141	
Dew, The Formation of	52
Drought of Oct. and Nov., 1897...149, 169	
Earthquakes 25, 92	
Earth Temperature, Frost, and Water Pipes	95
Electrical Manifestations..... 27, 127	
Errata in Meteor. Magazine, 1896...	111
Europe, Floods in Southern	108
Exhibition of Meteorological Instruments, 1837-1897	37
February, 1897, The Temperature of	21
First Daily Weather Map, The... 33, 133	
Floods in Southern Europe	108
Formation of Dew, The	52
Fromondus on the Weather 101, 117, 185	
Frost, Earth Temperatures and Water Pipes	95
Gale of March 3rd, 1897, The	23
Gale on November 28th, 1897 ... 170, 181	
Hail 50, 65, 68, 69, 88, 171	
Hail, Experiments to drive away...	141
Hereford Earthquakes, The	25
High Temperature on the Night of August 4th..... 123, 139	
Hydrography, Austrian	155
Icy Saints, The.....	59
Inclined Air Currents	188
Index to Vols. I.-XXX. of the Meteorological Magazine..... 34, 111	
Indian and Australian Earthquakes	92
July, Storm Rains in	103
July 16th, Whirlwinds on	106
June 24th, Thunder and Hail on ...	81
June 30th, Whirlwinds on.....	106
Kimberley, S. Africa, Sunshine at...	17
Kite-flying in Scotland	190
Kites, Thermo-Hygrograph-Carrying	140
Kite Work in the Arctic Regions...	34
Lightning, Damage by..... 88, 124, 141	
Low Temperatures, Water at Unusually	1
Malta, Increased Cloudiness of	159
March 3rd, 1897, The Gale of	23
May 5th, 1897, Heavy Rainfall at Port Elizabeth	73
Meteoric Shower in November, The	167
Meteorites, On the Worship of.. ...	51
Meteorological Exhibition, 1837-1897.....	37
Meteorological Magazine, Index to Vols. I.-XXX..... ..... 34, 111	
Meteorological Notes on the Months 15, 31, 47, 63, 79, 99, 115, 131, 147, 163, 179, 195	
Meteorological Society, The Royal 5, 25, 36, 58, 75, 94, 173, 186	
Meteorology in Belgium	91
Meteorology in Schools	108
Mountain Observatories, Objections to.....	107
Muswell Hill, Rainfall at	39
Nile, Sand Storm on the.....	142
November 12th, 1897, Rain in the Lake District	165
November 28th, 1897, Gale on 170, 181	
November, Temperature Variations in	168
Obituary—Abercromby, The Hon. Ralph	117
,, Casella, Louis Pascal ...	49
,, Zambra, Joseph W. ...	181
Observatories, Objection to Mountain	107
October and November, 1897, The Drought and Rainfall of..... 149, 169	
Port Elizabeth, Heavy Rainfall at...	73

PAGE

REVIEWS :—

Hellmann, Prof. Dr. Neudrucke von Schriften und Karten. Berlin, 1896 10

No. 7. Evangelista Torricelli. Esperienza dell' Argento Vivo, Accademia del Cimento. Instrumenti per conoscer l'alterazionii dell' aria.. 10

No. 8. E. Halley, A. von Humboldt, E. Loomis, U. J. Le Verrier, E. Renou. MeteorologischeKarten,1688, 1817, 1846, 1863, 1864 11

No. 9. Henry Gellibrand. A Discourse Mathematical on the Variation of the Magneticall Needle. London, 1635 11

Russell, H. C., B.A., C.M.G., F.R.S. On Periodicity of Good and Bad Seasons 40

Hepites, Stefan C. Buletinul Observatiunilor Meteorologice din Romania. Anul V., 1896. Bucuresci, 4to, 1897 42

Vallot, J. Annales de l'Observatoire Météorologique du Mont Blanc. Tome II., 1896 42

Taylor, Capt. E. R., F.R.Met.Soc. Report and Results of Meteorological Observations made at Ardgillan, co. Dublin, during the year 1896..... 43

Russell, Hon. F. A. R. The Atmosphere in relation to Human Life and Health. Smithsonian Institution, Washington. 1896 54

Clayton, J. Effects of the Weather upon Vegetation : a Lecture. Bradford, 1897 56

Clayton, H. H. Blue Hill Meteorological Observatory, U.S.A. Discussion of the Cloud Observations. 1896 57

Denison, N. The Great Lakes as a Sensitive Barometer. [Toronto, 1897.] 8vo, Excerpt Proc. Canadian Institute 74

Denison, N. A Probable Solution of the Secondary Undulations found upon Self-Recording Tide Gauges. [Toronto, 1897.] 8vo, Excerpt Proc. Canadian Institute..... 74

Archibald, E. Douglas. The Story of the Earth's Atmosphere. 1897 110

Hydrographic Office, Washington, U.S.A. Illustrative Cloud Forms for the guidance of observers. 1897 110

PAGE

Denning, W. F., F.R.A.S. The Great Meteoric Shower of November. 1897..... 158

Richard, J. Instruments de Précision. No. 1 Météorologie. 1897 175

Mohn, H. Klima-Tabeller for Norge. Christiania 1896 & 1897 187

Rain and Thunderstorms 103, 124

Rain in Lake District, Nov. 12th... 165

Rainfall and Temperature, Monthly 14, 30, 46, 62, 78, 98, 114, 130, 146, 162, 178, 194

Rainfall at Muswell Hill..... 39

Rainfall of October and November, 1897, The..... 149, 169

Rains, So-called Sulphur 138

Remarkable Hailstones..... 68, 171

Saints, The Icy..... 59

Sand Storm on the Nile 142

Schools, Meteorology in 108

Scotland, Kite work in 190

Seaford, Hailstorm at, May 30th, 1897 ..... 65, 69

Seismological Survey of the World 26,137

Storm Rains in July 103

Storms of June 24th, The 81

Sulphur-Rains, So-called 138

Sunshine at Kimberley, S. Africa... 17

Sunshine in Summer, Sunless Days and the Day Distribution of ... 137

Supplementary Tables of Rainfall 13, 29, 45, 61, 77. 97, 113, 129, 145, 161, 177, 193

Temperature, High, on night of August 4th..... 123, 139

Temperature of February, 1897, The 21

Temperature Variations in November 168

Temperatures, Earth, & Water Pipes 95

Temperatures, Water at Unusually Low..... 1

Thermo-Hygrograph-Carrying Kite 140

Thunder and Hail Storms...50, 69, 81, 124

Tides, The November Gale and..... 181

Time, True 136

Tornado at Este's Park, Colorado... 9

Toronto, British Association at..... 143

True Time 136

Victoria, Phenomenal Weather in... 27

Water at Unusually Low Temperatures 1

Weather, Fromondus on the 101, 117, 185

Weather in Victoria, Phenomenal... 27

Weather Map, The First Daily... 33, 133

Wet Day in a Wet District, A 165

Whirlwinds on June 30th & July 16th 106

Winter Nights, Warm 190

Winters in Berwickshire 93

Worship of Meteorites, On the..... 51

Zambra, Joseph Warren..... 181

[XXIII.]

[PRICE FOURPENCE.
Or 5s. per annum post free.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
...ually Low Temperatures	1
...ological Society	5
...Estes Park, Colorado	9
...n von Schriften und Karten ... herausg. von Prof. Dr. Hellmann.	
...—Evangelista Torricelli. Esperienza dell'Argento Vivo, Accademia del Cimento. Instrumenti per ...osservar l'Alterazioni dell'Aria	10
...—E. Halley, A. von Humboldt, E. Loomis, U. J. Le Verrier, E. Renou. Meteorologische Karten, 1688, 1817, 1846, 1863, 1864	11
9.—Henry Gellibrand. A Discourse Mathematical ...on the Variation of the Magneticall Needle. 1635...	11
...l Table for the British Empire, August, 1896 ...	12
...y Table of Rainfall, January, 1897	13
Temperature in January, 1897, at 50 Stations... ...	14
...l Notes on January, 1897	15

FEBRUARY, 1897.

LONDON: EDWARD STANFORD,
...OCKSPUR STREET, CHARING CROSS, S.W.

...ELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy"*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIII.] FEBRUARY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

WATER AT UNUSUALLY LOW TEMPERATURES.

ON Monday, November 30th, the Observer at Camden Square, having finished the usual 9 a.m. Meteorological readings, reported that the water-supply for the wet bulb thermometer on the Glaisher screen (I.) was not frozen, though the air temperature was 29°·1; and examination showed that the water was absolutely free from ice, though the muslin, and the wick from the edge of the water vessel to it, were frozen. There is on the same screen another hygrometer, the water supply for which was frozen into a solid mass of ice not adhering to the vessel. This second water-vessel, (II.) though more protected from radiation, was more exposed to the wind.

The night had been clear and cold, at 9 a.m. the sky was almost cloudless and the sun shining brightly, but there was a slight accumulation of London smoke in the air, not sufficient to justify the use of the word fog or foggy. The wind was very light from E. or E.N.E. These general conditions of weather continued practically unchanged until noon.

Our immediate impression was that the water in I. remained unfrozen owing to the stillness of the air, and that rapid congelation would take place on the slightest disturbance, but stirring the surface lightly with the point of a cedar pencil produced no result. An unmounted mercurial thermometer was then obtained, and at 9.15 a.m. a series of readings commenced. The temperature of the water was ascertained by immersing the bulb and about an inch of the stem of the thermometer and stirring for 15 or 20 seconds, then reading and again stirring for 15 or 20 seconds, and again reading; if the two readings were not identical, the process was repeated. The bulb of the thermometer was not withdrawn from the water during reading.*

Time	9.0	9.15	9.45	10.0	10.15	10.30	11.0	11.30
Dry bulb ...	29°·1	29°·5	30°·9	31°·8	32°·2	33°·1	34°·6	35°·7
Water in No. I....	—	28·1	29·2	30·0	30·6	31·1	32·5	33·4

* This thermometer is by Casella, No. 19409, graduated on the stem about 15 years ago, bulb 0·23 inch diameter, taking up the true temperature in water in 15 seconds. It was compared with a Kew Standard in water, the error being at 34°·0 + 0°·6. In a drained vessel of broken ice its error was + 0°·7, and this correction has been applied to all its readings.

The minimum temperature occurred about 5.30 a.m., and was 25°·4, and there appears to be justification for assuming that the water in I. fell to very nearly this temp. without the formation of ice.

It will be seen that the temperature rose gradually, but the other conditions as before described remained unchanged, until at 9.45 a.m. it was found that the muslin and wick were thawed, the temperature of the air being 30°·9 and of the water 29°·2.

At 10.30 a.m. the ice in vessel No. II. was beginning to thaw, and moisture was visible between the ice and the glass, but there was not sufficient to flow.

By 11 a.m. the temperature of the air had risen to 34°·6, and of the water in No. I. to 32°·5, not an atom of ice having been seen in or on the water during the whole time.

Three new unused stoppered glass bottles were obtained, and at 2 p.m. all the water from vessel No. I. was bottled, the remaining ice in No. II. was melted by placing the vessel in warm water in the open air, and the whole of its contents were put into the second bottle, while the third bottle was filled with water from the store of rain water kept for replenishing the vessels I. and II.

This store is an uncorked glass bottle kept standing in the observer's office, which is filled from time to time with the rain caught in a copper rain gauge (thoroughly oxidised) with a copper receiver.

These three bottles—marked "Liquid" (vessel I.), "Frozen" (vessel II.), and "Supply"—were handed to Mr. M. J. Salter, F.I.C., F.C.S., who kindly undertook their chemical examination. From his notes we have extracted the following.

"It seemed to me that the first thing was to try to freeze the sample marked "Liquid," and notice how it behaved. I therefore took an ordinary 6 × $\frac{3}{4}$ inch test tube which had been in use for general work, and after washing it as usual, and finally with distilled water, carefully wiped it dry and polished it inside with a clean cloth. I used this same test tube throughout all the experiments. From the irregular way the water-drops adhered to the glass, I infer that it was slightly greasy. It certainly was not catharised in Tomlinson's sense (*Journ. Chem. Soc.* xxii. 125). Into this I poured enough of the water to cover the stem of the thermometer (your Casella 19409) to about 40°, but in the first freezing experiment I found it inconvenient to have so much water, and therefore for all the others I worked with the surface somewhat below 25°, which allowed me to plunge the water column almost entirely below the surface of the freezing mixture. For the freezing mixture I used ice and salt, with no special precautions as to temperature. The thermometer had a slip of wood tied across it, which just kept its bulb from touching the *bottom* of the test tube (say about $\frac{1}{8}$ inch up). I now employed two methods of observation.

(1) As the falling temperature approached 33° I stirred the

water continuously with the thermometer, stopping every few seconds just long enough to get a reading.

(2) Leaving the thermometer hanging at rest in the water, I avoided disturbance as completely as possible, and simply watched the course of the mercury.

The following table will now speak for itself.

	Method of observation.	Lowest reading.	
Sample "Liquid" (*Water from vessel No. I.*).			
	Stirring.	26°·8	At this moment spicules of ice were seen to be adhering to the thermometer, and temp. rose suddenly to 32°·0.
Warmed to 52°	,,	32°·0	Ice formed as soon as 32°·0 was reached.
,, ,, 75°	,,	24°·7	Then suddenly shot up to 32°·0, and most of the sample became solid.
,, ,, 65°	Unstirred.	28°·8	Rose suddenly to 31°·9.
,, ,, 75°	,,	28°·7	,, ,, ,, 32°·0.
Sample "Frozen" (*Water from vessel No. II.*).			
	Unstirred.	31°·3	Then rose to 31°·8, and a crystal of ice seen.
Remelted.	Stirring.	26°·4	Solidified suddenly, with rise to 32°·0.
Warmed to 47°	,,	27°·7	,, ,, ,, ,, 32°·0.
Sample "Supply" (*Water from store*).			
	Unstirred.	31°·1	At moment, when this reading obtained, it was found that nearly half the water was frozen.
Warmed to 55°	,,	30°·1	Then rose to 31°·8, and most of it found to be solid.
,, ,, 50°	,,	31°·6	Then rose to 31°·8, and most of it found to be solid.

The above show that the solidification is extremely capricious and that this is not due to the presence of any substance in solution which produces an absolute lowering of the freezing point, but is rather to be attributed either to the absence of nuclei, or possibly to the presence of some substance such as tarry matter by which ordinary nuclei are rendered inert. I noticed later on that the samples showed a tendency to form films, as if there was present some substance which increased the surface tension. As far as can be judged from the somewhat negative character of the results with "Supply," it seems that the exposure to a smoky atmosphere in the open glass vessels on the Glaisher screen had increased the tendency to resist freezing.

I next took the specific gravity of the samples at 60° F., using a Sprengel sp. gr. tube, which holds 12·5575 grams of distilled water. This, having been made originally for taking the sp. gr. of oils and varnishes, has rather wide capillaries, so that it is scarcely fit for work of the highest refinement. The results I got, were, however—

"Liquid"	1·00023.
"Frozen"	1·00059.
"Supply"	1·00013.

These numbers are quite sufficient to show that the impurities present are not in sufficient quantity to affect the freezing point, even if the rise of the thermometer to 31°·8—32°·0, as soon as ice began to form did not indicate that 32° was the true freezing point.

The question at issue being one of temperature, refined determination of impurities appeared unnecessary, but—

"LIQUID" showed—Ammonia in considerable quantity with Nessler.

" " Sulphuric acid or a sulphate with barium chloride.

" " Oxidisable organic matter (? sulphurous acid) with permanganate.

" " Non-volatile matters, both organic and mineral, when evaporated on platinum foil.

Comparative observations with distilled water were also made.

A test-tube, with no special cleaning, was employed, and distilled water, neither specially pure, nor quite free from dust.

DISTILLED WATER.

	Method of observation.	Lowest reading.	
	Unstirred.	22°·1	Then rose to 32°·0, and became solid.
Warmed to 40°.	"	25°·3	Then rose suddenly to 32°·0, and whole mass became solid.

Fresh distilled water from same supply.

	Unstirred.	17°·3	Thermometer touched and found to be loose, instantly rose to 32°·0, and whole solidified.

Fresh distilled water from same supply.

Warmed to 45°.	Unstirred.	12°·3	Then the whole froze with a sort of flash, and temp. rose to 31°·8.

Tube wiped carefully, and fresh distilled water from same supply.

	Stirred.	28°·3	Then rose to 32°·1, and changed to ice.

So far the report. Is it generally known that ordinary or distilled water in an open vessel can, with extreme ease, and without any precautions, be cooled nearly 20° F. below freezing point without solidifying? Is 12°·3 F. the lowest to which a mass can be cooled? We can trace no statement on the subject in any book on physics which we have consulted. Prof. Everett, in his translation of Deschanel, tells us that "Despretz has cooled water to —20° C. (—4° F.) in fine capillary tubes, without its freezing, and Dufour has obtained a similar result by suspending globules of water in a liquid of the same specific gravity, with which it would not mix, this liquid being one which had a very low freezing point."

These cases are, however, quite different, the case before us is one of a wine-glassful of water—not of water in "capillary tubes," or individual globules.

Prof. Atkinson, in his translation of Ganot, says, "The freezing point of pure water can be diminished by several degrees if the water be previously freed from air by boiling, and be then kept in a perfectly still place. In fact, it may be cooled to —15° C. (5° F.) and even lower, without freezing. But when it is slightly agitated the liquid at once solidifies."

In the case reported above, the water had not been "boiled," and far from being "still," had been repeatedly stirred with a black-lead pencil, and with a thermometer bulb.

Lastly, we referred to Larousse's *Grande Dictionnaire* with the following result:—

"A 0° C. l'eau prend l'état solide; on peut cependant, en la protégeant bien contre tout agitation, la refroidir jusq' à —12° C. (10°·4 F.) sans qu'elle se congèle. La moindre secousse détermine alors la congélation immédiate de la masse et la température remonte à 0° C. (32° F.)."

Here again it is pointed out that the least shock will produce immediate congelation; but the water in vessel I. was not merely shaken, but stirred, without freezing, when several degrees below 32° F.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday evening, the 16th December, 1896 at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. R. H. Curtis read a paper entitled: "An Attempt to Determine the Velocity Equivalents of Wind-Forces estimated by Beaufort's Scale."

For such a comparison to be satisfactory, four conditions are essential:

(1) The observations should be made at an exposed station, where it may reasonably be expected that the full range of wind-force would be experienced.

(2) The station should be provided with an anemometer, the constants of which are known, and which should occupy a position entirely free from purely local disturbing influences.

(3) The estimations of wind-force should be made by an observer of experience, stationed in the same locality as the anemometer, but acting independently of its indications.

(4) There must be available a sufficiently long series of observations to yield reliable mean results.

Of all the records available those for Scilly appeared most nearly to fulfil the above requirements, and that station was adopted as the principal one. Fleetwood and Yarmouth being used as check stations, and also readings of the Dines's tube anemometer, at Holyhead. In all, 10,263 observations at Scilly were dealt with, and

12,098 at the other stations. The results of the Robinson Anemometers were corrected by the application of the factor appropriate to each instrument, and the readings were further checked by comparison with observations of the tube anemometer. The wind forces estimated by the observers were checked by comparison, with similar estimates made at neighbouring light-ships, or light-houses. The winds from different points of the compass being separately examined to see how far they yielded accordant results.

The values yielded by the Scilly observations are :—

Mean Velocity Equivalents, in miles and tenths, obtained from the observations made with the Robinson Anemometer at Scilly.

Estimated Force by Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity	...	3·9	6·7	9·3	13·5	19·8	26·0	31·7	36·9	43·0	51·5	63·1	...

While those finally adopted by the Author as the result of the whole discussion are :—

Velocity Equivalents for Estimated Forces by Beaufort's Scale.

Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity in miles per hour ...	2	4	7	10	14	19	25	31	37	44	53	64	77
Metres per sec.	0·9	1·8	3·1	4·5	6·3	8·5	11·2	13·9	16·5	19·7	23·7	28·6	34·4

The President remarked that to adopt the new factor for the Robinson's cup anemometer would make a great alteration from the values we were accustomed to see : 105 miles an hour would become 77 miles ; 87 miles, 64 ; 72 miles, 53, and so on.

Mr. Chatterton thought that Mr. Curtis had treated the 1887 results of the Wind Force Committee too politely. The Committee had worked on data based on a fallacious coefficient, and they now found that the exposure of the anemometers was also bad. He hoped that the day had gone by when results of useless observations would continue to be printed at the public expense.

Mr. Dines considered the practice of continuing to use a wrong factor—one that everybody who printed and who read the results knows to be wrong—was indefensible. In early years he had been surprised that the Scilly values were far below those for Holyhead ; but he afterwards found out that the Scilly instrument was not of the standard pattern, and that for it the factor 3 was practically correct.

Mr. Charles Harding believed that the Wind Force Committee had not arrived at an absolute decision as to what is best to be done, and he suggested that no alteration should be made before 1900. If a change were made now, another might be necessary a year or two

hence. He criticised Mr. Curtis's value of 2 miles an hour for force 0, or dead calm.

Mr. Symons exhibited a diagram showing some eight or ten different determinations of the equivalents of Beaufort scale, and remarked on the wide variation between them.

Mr. Gaster suggested that Mr. Symons's diagram illustrated the necessity for Mr. Curtis's paper. In a calm, light airs from various directions would all act on the anemometer, and cause revolution of the cups. He thought it was often forgotten that the extreme estimates of velocities of 100 or 120 miles an hour, were estimates in terms of West India hurricanes, which no canvas could stand. It must be remembered that the results based on factor 3 *are* printed, and the amount of confusion that would be caused by alteration would be very great.

Mr. Sowerby Wallis considered the paper a final settlement of what the Beaufort Scale means now; but he did not feel sure that it was the same when Admiral Beaufort invented it. Mr. Curtis's values show a steadily increasing increment of velocity for each value of the scale, while some of the earlier determinations—notably Sir H. James's—show a uniform increment. Would it be possible to get, on this point, the opinion of old salts who remembered sailing ships?

Mr. Brodie believed that finality, if not reached, was very nearly approached. In the paper, the Scilly values were treated as nearly perfect; but the observer is an old man, who would probably be soon superseded, and change of observer often results in change of the forces recorded. Estimation should be abolished altogether, by the use of a portable anemometer.

Mr. Ellis found that if Mr. Curtis's figures are taken to one place of decimals they run much better, and agree very closely with a mathematical formula which he had worked out, which gives for force 0, 1·6 miles. He asked whether Mr. Curtis considered the factor as constant for all velocities?

Capt. Carpenter doubted whether officers of the present day had any idea what sail a frigate could carry; but the state of the surface of the sea was a useful aid—the beginning of the formation of "white horses" indicated a wind of force 4. Some portable anemometer would be a great improvement on the use of the Beaufort Scale.

A paper by Dr. Leigh Canney on the "Winter Climate of Egypt" was read by the Secretary. The climate of Egypt during the winter is influenced by the Libyan desert, by the Mediterranean Sea, and by the extent of cultivated land. The author gave the results of a series of observations which he had carried on during the past three winters. The observations were started with the object of arriving at a comparative knowledge respecting the climates of the various stations now considered as health resorts in Egypt, and by a strictly comparable method to arrive at the precise differences between the climates of Upper and Lower Egypt, all previous observations having

failed in this respect. The stations at which observations were made were Cairo, Helouan, Mena House Hotel, Luxor, Assouan, the Valley of the Tombs of the Kings, and the crest of the Libyan Hills. As self-recording thermometers and hair hygrometers were used at each station, valuable data have been obtained on the diurnal variation of temperature and humidity.

Dr. Marcet considered the paper a very valuable one, but there were one or two points on which he would have liked more information—the treatment of the question of rainfall, for instance, being very slight. Solar radiation temp. also is very important, but difficult to observe, as the sun max. in vacuo seems to be unsatisfactory, but the shade temperatures given in the paper were no guide to the heat to which our soldiers were exposed in the last campaign. The slight fall of temp. at sunset at Luxor was interesting, and he (the speaker) had more than once observed an almost equal rise of temperature. The sensation of chilliness was not felt in Upper Egypt till about 4 hours after sunset, while in Lower Egypt it was felt much sooner.

Dr. Theodore Williams said that the traces exhibited seemed wonderfully uniform at the different stations, and also day after day. It was surprising to see that in the desert, where there is utter absence of vegetation, there is less range of temp. than in the cultivated regions. What struck him most with regard to humidity was, not the lowness of the values, but that in the night the percentage rose at times to 80, and the wonder was where the moisture came from. As regards rainfall in Upper Egypt, there is practically none to record. The position of the instruments on roofs was contrary to English ideas, but it was necessary to get up 40 or 50 ft. to get above the rise of the Nile.

The annual general meeting of this society was held on Wednesday January 20th, at the Institution of Civil Engineers, Great George-street, Westminster, Mr. E. Mawley, President, in the chair. The president delivered an address on "Shade Temperatures," in which he stated that of all meteorological observations there were none approaching in importance those made of the temperature of the air—generally known as shade temperature. Mr. Mawley traced the history of the different methods of exposing thermometers since the time that regular observations of the weather had been made in this country. For many years open screens were most favoured by meteorologists, that devised by Mr. J. Glaisher, F.R.S., and the late Astronomer Royal (Sir G. B. Airy, F.R.S.) being the pattern principally used. In 1864 Mr. T. Stevenson, C.E. invented an admirable form of closed screen with louvred sides, which was considered preferable to the open type of screen, and has now almost entirely superseded the Glaisher stand. In 1883 the Stevenson screen was considerably improved by a committee of the Royal Meteorological Society. Mr. Mawley then described his own experiments at Croydon and Berk-

hamstead with this improved screen, known as the Royal Meteorological Society's pattern. He advised the general adoption of this form of thermometer exposure, both in this country and on the Continent. He had recently made observations in the Stevenson screen, and also in the screens used in France and Germany, and the conclusion he had come to was that the results obtained in the Stevenson screen were not only the nearest to the true air temperatures, but also more likely to be independent of surrounding conditions than other patterns.

A TORNADO AT ESTE'S PARK, COLORADO.

We have been favoured with the following description, and insert it with the object of ascertaining what foundation there is for the impression that tornadoes are creatures of the plains. Este's Park is (we see by Dr. Theodore Williams's Presidential Address to the Royal Meteorological Society, where it is fully described) 7,500 feet above sea level, so that the average reading of the barometer there must be about 22½ inches or only three-quarters of that in the plains; evidently therefore to produce equal structural damage the velocity of the wind must be much greater. Hence we have three points on which information is desirable, (1) Is it a fact that Tornadoes rarely occur at high altitudes; or (2) Is their force less, and do they thereby escape notice? (3) Are they more rare because the conditions of heat and moisture necessary for their formation do not exist?

Extract from letter by Mr. H. C. Rogers, dated Este's Park, Colorado, Nov. 4th, 1896:—

The place where I am staying is in summer run as an hotel; now another man and I are the only visitors. During the last ten days the weather has not only been cold but made objectionable by a cold west wind. About 4 p.m. to-day a friend, Dr. James, called, and we three were sitting in a room which opens on to a verandah. Suddenly we heard the sound of a terrific rushing wind and the rattle of gravel and debris, the house swayed, the windows were darkened and then suddenly the room was more light than usual. The front of the house consists of two sides of a square, and it is firmly built with a verandah 8 feet deep all round the two sides. On going out we found that about 55 feet of the verandah had been carried away—a few yards, severed from the portion carried away, lay on the ground a heap of splinters, but by far the larger portion had been lifted over the wing of the house and deposited by the river 85 yards away. We have also heard that timbers were seen flying over the Post Office, distant about a quarter-of-a-mile, and they may have been part of our verandah. In seven windows facing the verandah not a pane of glass was broken. The outer door (a sort of door with wire gauze instead of panel) was ripped off its hinges, and is a mass of splinters. The whole performance, from the first sound of the whirl

until the business was over, could not have been more than five seconds. Just before this a strong blast of wind started up from the east, the opposite direction to that of the strong wind that has prevailed during the last few days—they apparently met near here and took the form of a cyclone. I do not think that it came from any considerable distance, nor do we think that it travelled far, for we could see no trees down or other signs of destruction. This is an extremely rare occurrence at an altitude where the atmosphere is so rarified, and nobody seems to have heard of such a tornado in these mountains before—although of course it is nothing to be compared to what happens at lower elevations out in the plains east of this place, such as occurred at St. Louis not many months ago.

REVIEWS.

Neudrucke von Schriften und Karten . . . . herausg. von Prof. Dr. HELLMANN. Berlin: A. Asher & Co. 4to. 1896.

No. 7.—EVANGELISTA TORRICELLI. *Esperienza dell'Argento Vivo. Accademia del Cimento. Istrumenti per conoscer l'Alterazioni dell'Aria.*

THIS may be described as an essay on the invention and early history of the barometer, thermometer and hygrometer, and is perhaps the most important of this valuable series of works; not on account of the rarity of the works reproduced, for as we have ourselves five or six editions of the "Saggi" of the Accademia, including those of 1666 and of 1841, we can hardly regard it as very rare,* but because of the mass of information which Dr. Hellmann has inserted in the notes. Nothing but careful perusal can do justice to it; but, to take a very low indication of the information concentrated in it, we may mention that we find Dr. Hellmann quoting Greek, Latin, Dutch, English, French, German and Italian.

It is impossible within any ordinary limit to give a fair idea of the research epitomized in this book, the only conceivable complaint seems to us to be that it somewhat breaks down under its own wealth of confirmatory evidence, and gives the feeling of ones having been reading a dictionary rather than a book. No one without thoroughly mastering it must pretend to write the early history of the three instruments we have named, but we think that the "Einleitung" might with advantage have been relieved by some portions being transferred to the "Anmerkungen." As to these Remarks which occupy eight quarto pages, we know no other eight pages which contain so much useful information. Dr. Hellmann on

* A reference to the superb glass work of the Florentines in the middle of the 17th century, and an engraving of one of their thermometers, will be found on p. 91 of Vol. XI. (1876) of the *Met. Mag.*

p. 20 points out the desirability of an accurate comparison of the Florentine thermometer at the Royal Institution, with a standard; and we trust that that may soon be done.

No. 8.—E. HALLEY, A. VON HUMBOLDT, E. LOOMIS, U. J. LE VERRIER, E. RENOU. *Meteorologische Karten*, 1688, 1817, 1846, 1863, 1864.

SIX facsimile maps which Dr. Hellmann happily describes as milestones on the road of meteorological progress. Halley's Map of the Winds, Humboldt's first Isothermal Chart, Loomis's Storm Map, Early Isobaric Charts by Le Verrier (or possibly by Marié Davy ?) and Renou's Map of the Mean Isobars for France—this is the interesting set reproduced in No. 8. And there is of course the usual introduction and bibliography by Dr. Hellmann of a quality which no living man can equal, and from which one always learns something. For instance, we recently reproduced the first weather map, sold in the 1851 Exhibition; Dr. Hellmann gives us a paragraph in Dutch from a work by Dr. Buijs Ballot which shows that it was through seeing these maps that he was led to publish analogous ones in the Nederlandsch Meteorol. Jaarboek für 1852.

On another page Dr. Hellmann mentions that he possesses the first of a series of a sort of synoptic weather maps for November, 1725, by an unknown author residing at an unknown place, which bear the title "Erster Entwurf einer Witterungs-Charte darinne die Witterung wie man sie an verschiedenen Oerthern Teutschlandes in einem District von etlichen 80 Meilen lang und 60 Meilen breit, im Monath Novembr., 1725, beobachtet, vorgestellet wird."

No. 9.—HENRY GELLIBRAND. *A Discourse Mathematical on the Variation of the Magneticall Needle. London*, 1635.

A FACSIMILE reproduction of the copy of the above rare tract belonging to Mr. Latimer Clark, F.R.S. The first comparisons between the true terrestrial meridian and the magnetic meridian were made by Burrowes at Limehouse, Oct. 16, 1580, when he found it about 11° 16′ E. On June 13, 1622, Mr. Gunter at the same place found it to be about 5° 56′ E., but it does not seem to have occurred to him that this difference showed any secular change, and therein lies the merit of Gellibrand's paper in that he not merely determined the variation at Deptford on June 12, 1634, to be only 4° 4′ E., but pointed out the decrease of about 7° in 54 years.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	77·1	13	45·4	27	69·2	51·6	54·0	83	123·9	40·1	1·92	14	5·8
Malta	104·8	11	59·4	31	86·6	71·0	66·2	68	152·0	52·9	·00	0	2·2
Mauritius	75·0	7	58·6	8	72·6	63·2	57·2	71	121·9	47·3	2·08	16	5·0
Calcutta	89·8	28	75·6	3	87·6	78·7	78·2	87	157·7	75·1	11·02	21	7·7
Bombay	86·1	25	75·0	11	83·6	76·6	75·4	86	142·8	72·3	20·77	29	8·8
Ceylon, Colombo	88·0	15	73·3	4	85·4	77·3	73·2	80	145·0	70·0	6·35	15	6·1
Melbourne	67·2	22	35·8	2	56·6	42·4	43·1	74	118·0	24·8	2·75	14	6·8
Adelaide	71·7	22	37·7	3	61·3	44·1	42·5	72	130·1	29·3	1·23	15	6·3
Sydney	67·7	23	40·5	1	59·2	45·7	43·9	81	117·7	29·8	1·78	12	3·4
Wellington	60·0	25	34·0	5*b*	53·7	42·0	40·0	75	116·0	21·0	3·63	17	4·6
Auckland	64·0	31	38·0	11	57·2	46·3	42·8	73	121·0	32·0	3·65	...	5·4
Jamaica, Kingston	91·8	19*a*	70·4	22	90·7	74·1	70·7	71	...	...	·40	5	...
Trinidad	91·0	19	68·0	9	88·4	71·7	74·2	84	176·0	67·0	7·66	20	...
Grenada	86·2	8	72·2	15	83·3	74·7	70·7	73	148·4	...	8·81	23	3·9
Toronto	89·9	4	42·3	20	79·2	56·6	57·9	70	107·0	37·0	1·13	9	4·7
New Brunswick, Fredericton	92·7	11	40·3	31	76·6	51·4	54·0	66	...	...	1·10	11	4·1
Manitoba, Winnipeg	84·6	7	32·0	31	74·8	48·0	...	...	...	...	1·51	11	4·7
British Columbia, Esquimalt	73·7	6	46·2	11	68·3	50·9	53·5	85	...	...	·57	5	6·3

a—and 23. *b*—and 6, 10.

REMARKS.

MALTA.—Adopted mean temp. 77°·7, or 0°·5 below the average. Mean hourly velocity of wind 9·4 miles. Average temp. of sea 79°·0. TS on 28th. Absolute max. the highest reading recorded in 13 years, while the absolute min. is the lowest for August. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3, dew point 2°·0, and rainfall ·19 in., below, their respective averages. Mean hourly velocity of wind 12·5 miles, or 0·2 above average; extremes, 28°·6 on 1st, and 2·3 on 10th and 11th; prevailing direction, E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on the 18th, 19th and 26th. F. W. GRIMLINTON.

Adelaide.—Mean temp. 1°·3, and rainfall 1·14 in., below the average for 39 years. The winter throughout South Australia has been very dry. C. TODD, F.R.S.

Sydney.—Rainfall 1·04 in. below, humidity 7°·7 above, and temperature 2°·5 below, their respective averages. This month was remarkable for the number of cloudless nights, hence dew was measured on 13 days amounting to ·065 in. The average max. is the lowest since 1861. H. C. RUSSELL, F.R.S.

Wellington.—The first part of the month was generally fine, with occasional showers and light winds, the middle showery, then fine weather until the end, when it was showery and unsettled. S on the hills during the latter part of the month. H on 8th and 17th. Fog on 6th. R. B. GORE.

Auckland.—Weather warm and mild during the greater portion of the month. Barometrical pressure and mean temp. both considerably above the average. Rainfall considerably below. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·66 in. below the 30 years average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	2·96	XI.	Lake Vyrnwy	1·81
,,	Birchington, Thor	2·34	,,	Corwen, Rhug	1·78
,,	Hailsham	2·68	,,	Criccith, Talarvor.....	1·60
,,	Ryde, Thornbrough	2·87	,,	I. of Man, Douglas	2·53
,,	Emsworth, Redlands ...	2·87	XII.	Stoneykirk, Ardwell Ho.	1·65
,,	Alton, Ashdell	2·28	,,	New Galloway, Glenlee	2·99
III.	Oxford, Magdalen Col..	1·79	,,	Lilliesleaf, Riddell	1·38
,,	Banbury, Bloxham	2·00	XIII.	N. Esk Res. [Penicuick]	2·35
,,	Northampton, Sedgebrook	2·49	,,	Edinburgh, Blacket Pl..	·80
,,	Duddington [Stanford]..	2·21	XIV.	Glasgow, Queen's Park..	1·22
,,	Alconbury	1·94	XV.	Inverary, Newtown	1·48
,,	Wisbech, Bank House...	1·76	,,	Oban, The Corran	1·15
IV.	Southend	2·29	,,	Islay, Gruinart School ...	1·09
,,	Harlow, Sheering..... ...	2·27	XVI.	Dollar.....	1·88
,,	Colchester, Lexden	2·09	,,	Balquhidder, Stronvar...	2·54
,,	Rendlesham Hall	2·34	,,	Ballinluig	1·68
,,	Rushall Vicarage	1·87	,,	Dalnaspidal H.R.S.....	3·03
,,	Swaffham	1·62	XVII.	Keith H.R.S.....	·64
V.	Salisbury, Alderbury ...	2·42	,,	Forres H.R.S.	1·22
,,	Bishop's Cannings	2·18	XVIII.	Fearn, Lower Pitkerrie..	·96
,,	Blandford, Whatcombe .	2·49	,,	N. Uist, Loch Maddy ...	2·18
,,	Ashburton, Holne Vic...	4·09	,,	Invergarry.....	1·35
,,	Okehampton, Oaklands.	3·27	,,	Aviemore H.R.S.	1·72
,,	Hartland Abbey	2·08	,,	Loch Ness, Drumnadrochit	1·66
,,	Lynmouth, Glenthorne.	2·78	XIX.	Invershin	1·66
,,	Probus, Lamellyn	4·15	,,	Scourie	1·78
,,	Wellington, The Avenue	2·22	,,	Watten H.R.S.....	1·45
,,	Wincanton.....	1·99	XX.	Dunmanway, Coolkelure	5·73
VI.	Clifton, Pembroke Road	1·90	,,	Cork, Wellesley Terrace	4·00
,,	Ross, The Graig	2·42	,,	Killarney, Woodlawn ...	3·72
,,	Wem, Clive Vicarage ...	2·27	,,	Caher, Duneske	2·67
,,	Cheadle, The Heath Ho.	1·85	,,	Ballingarry, Hazelfort...	2·04
,,	Worcester, Diglis Lock	1·93	,,	Limerick, Kilcornan ...	1·74
,,	Coventry, Kingswood ..	2·43	,,	Broadford, Hurdlestown	1·50
VII.	Grantham, Stainby	2·66	,,	Miltown Malbay	2·57
,,	Horncastle, Bucknall ...	2·25	XXI.	Gorey, Courtown House	2·93
,,	Worksop, Hodsck Priory	2·37	,,	Athlone, Twyford	1·92
,,	Neston, Hinderton	1·25	,,	Mullingar, Belvedere ...	2·40
VIII.	Southport, Hesketh Park	·97	,,	Longford, Currygrane...	1·85
,,	Broughton-in-Furness ...	1·54	XXII.	Woodlawn	2·19
IX.	Ripon, Mickley.....	1·73	,,	Crossmolina, Enniscoe ..	2·70
,,	Melmerby, Baldersby ...	1·75	,,	Collooney, Markree Obs.	2·12
,,	Scarborough, Obs.	2·66	,,	Ballinamore, Lawderdale	2·03
,,	Middleton, Mickleton ...	1·31	XXIII.	Lough Sheelin, Arley...	1·60
X.	Haltwhistle, Unthank...	1·11	,,	Warrenpoint.....	2·79
,,	Bamburgh	1·86	,,	Seaforde.....	2·22
,,	Keswick, The Bank.....	1·20	,,	Belfast, Springfield	2·11
XI.	Llanfrechfa Grange	2·53	,,	Bushmills, Dundarave..	1·86
,,	Llandovery	2·24	,,	Stewartstown	1·38
,,	Castle Malgwyn	3·03	,,	Killybegs	2·43
,,	Builth, *Abergwesyn Vic.*	2·66	,,	Lough Swilly, Carrablagh	1·21
,,	*Rhayader, Nantgwillt* ...	2·70			

JANUARY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·05	+ ·43	·83	8	20	47·0	10	23·4	18	15	22
II.		Maidstone (Hunton Court)...	2·22	+ ·67	·50	7	12	...	...	...	...	...	...
,,		Strathfieldsaye	2·44	...	·57	8	12	...	...	...	...	...	...
III.		Hitchin	2·25	+ ·71	·78	8	18	44·0	6	23·0	23*c*	25	...
,,		Winslow (Addington)	2·04	+ ·23	·57	8	20	48·0	7	17·0	18	21	25
IV.		Bury St. Edmunds (Westley)	1 99	+ ·52	·43	16	16	47·0	1	22·0	24	...	...
,,		Norwich (Brundall)	2·44	...	·49	16	26	45·0	1,10	22·0	26	21	24
V.		Weymouth(LangtonHerring)	1·95	— ·39	·54	7	15	49·0	10	22·5	24	15	...
,,		Torquay (Cary Green)	2·48	...	·73	7	16	50·1	11	24·0	24	11	19
,,		Polapit Tamar [Launceston]..	3·06	+ ·04	·67	29	15	51·3	10	18·5	18	18	20
VI.		Stroud (Upfield)	2·40	+ ·20	·43	8	15	47·0	7	21·0	23	21	...
,,		ChurchStretton(Woolstaston)	2·29	+ ·13	·41	8	20	43·5	7	21·0	23*d*	24	30
,,		Tenbury (Orleton)	2·15	+ ·01	·47	8	18	47·5	7	21·3	18	15	24
VII.		Leicester (Barkby)	1·44	— ·32	·26	7	20	44·0	1	12·0	17	24	30
,,		Boston	1·91	+ ·52	·43	8	18	47·0	6	22·0	26	20	...
,,		Hesley Hall [Tickhill].....	2·39	+ ·62	·66	7	21	43·0	1	20·0	24	24	...
VIII.		Manchester(PlymouthGrove)	1·00	— 1·46	·30	4	10	43·0	5, 6	18·0	23	21	22
IX.		Wetherby (Ribston Hall) ...	·87	— 1·02	·32	8	8	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·40	— 3·24	·47	4	15	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·85	+ ·08	·30	7, 14	19	49·0	1	21·0	26	22	24
X.		Newcastle (Town Moor)	2·09	+ ·28	·63	7	20	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	2·20	— 9·98	·55	3	11	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·26	— 1·03	·45	31	15	...	...	...	...	...	...
,,		Haverfordwest	3·40	— 1·02	·67	3	19	50·9	1	19·6	17	12	18
,,		Aberystwith (Gogerddan) ...	1·38	— 2·15	·25	26*a*	10	48·0	7	11·0	16*e*	25	...
,,		Llandudno.....	1·45	— ·83	·32	30	16	50·2	1	24·4	22	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·24	— 2·53	·36	7	8	47·4	1	16·0	18*f*	19	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.		Colmonell	1·70	...	·45	29	9	48 0	3	18 0	23	...	...
XV.		Lochgilphead (Kilmory).....	1·80	— 4·34	·30	25	12	...	...	20·0	14	21	...
,,		Mull (Quinish).....	1·56	— 4·11	·80	4	10	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·90	— 1·00	·50	8	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·75	— ·22	·40	30	16	48·1	1	22·3	25	21	...
XVII.		Braemar	1·76	— ·93	·22	9	20	48·3	7	13·4	23	24	30
,,		Aberdeen (Cranford)	3·18	...	·94	30	27	44·0	1, 2	20·0	16	21	...
,,		Cawdor (Budgate)	1·58	— ·59	·65	30	11	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·70	— 3·18	·65	8	5	...	...	...	...	...	...
,,		Glencarron Lodge.....	2·05	...	·40	24	17	49·3	2	19·1	17	24	...
XIX.		Dunrobin	1·36	— 1·10	·50	30	8	48·8	3	23·8	25	20	...
,,		S. Ronaldsay (Roeberry).....	1·43	— 1·52	·21	26	22	46·0	2	24·0	25	20	...
XX.		Darrynane Abbey.....	3·17	...	·56	29	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·44	— ·12	·60	6	16	50·0	3	20·0	18	16	...
,,		O'Briensbridge (Ross)	1·74	...	·57	31	13	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·55	— ·35	·46	5	18	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·69	+ ·83	·58	6	17	51·3	3	25·0	17	13	21
XXII.		Ballinasloe	2·01	— 1·07	·41	29*b*	16	48·0	2	23·0	16	15	...
,,		Clifden (Kylemore)	4·64	...	1·18	29	17	...	...	...	...	...	...
XXIII		Waringstown	2·26	— ·39	·57	29	15	48·0	2	16·0	16	23	26
,,		Londonderry (Creggan Res.).	1·61	— 1·81	·41	29	19	...	...	...	...	...	...
,,		*Omagh (Edenfel)*	1·55	— 1·47	·44	29	15	48·0	2	17·0	16	18	27

+Shows that the fall was above the average ; —that it was below it.

a—and 31. b—and 31. c—and 26. d—and 24. e—and 17. f—and 24.

METEOROLOGICAL NOTES ON JANUARY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—A very cold month. There have not been such S drifts, or so many roads blocked, since April, 1876.

ADDINGTON.—Rain and S on a good many days. The 23rd was a very wild day, a high wind blowing the S of the previous night into great drifts, blocking some of the roads in the district. From the 16th to the end the temp. was low, the average max. being only 35°, and the average min. of the same time 25°. Foggy on three days.

BURY ST. EDMUNDS, WESTLEY.—The month was mild till the 16th, then much S and winterly weather till the end. The snow was heavily drifted in some places, and a snow plough was very useful. S on 8 days.

NORWICH, BRUNDALL.—A rough, winterly month, with much snow during the second half. Strong gales with blinding S storms occurred on the 22nd and 23rd, and the drifts exceeded any in these parts since January, 1881. Mean temp. about 3° below average. Range of temp. unusually small. Winter aconite in flower on 1st, snowdrop on 9th, and crocus on 14th; all unusually early. Aurora on 2nd; fog on 5th; H on 14th. S on the ground from 17th to 31st inclusive.

WEYMOUTH, LANGTON HERRING.—With the exception of the 2nd, the first fourteen days were mild. From the 4th to the 12th there was a good deal of wet and fog. On the 15th the weather became much colder, and remained cold to the end of the month. The mean temp. at 9 a.m. (35°·8) is 2°·8 below the average of 25 years. Very little snow fell, and it never quite covered the ground. Fogs on 4 days.

TORQUAY, CARY GREEN.—Rainfall ·76 in. below the average. Mean temp. 39°·0, or 2°·6 below the average. Duration of sunshine 59 hours 55 minutes, being 7 hours 35 minutes below the average; twelve sunless days.

POLAPIT TAMAR [LAUNCESTON].—A cold, seasonable month, and, though rather wet during the first week and the last four days, the total rainfall is less than the average. Thick fog till 10.30 a.m. on 11th. Squally, with S, about 4.30 p.m. on 22nd, and S for 20 minutes at 2.30 p.m. on 23rd.

STROUD, UPFIELD.—Severe S storm from N.W. on 22nd, when about three-quarters of an inch fell; S also on 9th, 21st, 25th, 27th, 30th, and 31st.

WOOLSTASTON.—A severe month, with continued frost. S fell lightly on 9 days, but there was no heavy fall. Mean temp. 32°·7.

TENBURY, ORLETON.—A very cold, dismal month, with a mean temp. more than 3°·5 below the average of 36 years. No intense cold, but a succession of slight night frosts, with cloudy days. From the 4th to the 13th neither sun, moon, nor stars were ever visible. S on 9 days.

LEICESTER, BARKBY.—A cold month, especially so during the latter half. Very little sunshine. About 4 inches of S. Mean temp. 33°·1.

MANCHESTER, PLYMOUTH GROVE.—Mean temp. 34°·0—the lowest for January since observations commenced in 1868, with the exception of 1871, 1879, and 1881; and the driest January since 1868, with the exception of 1880, 1881, and 1896. Slight falls of S on the 9th and 19th; S storm on the 22nd; and S on 24th, 25th, 26th, and 29th. Dense fog on the 11th, 18th, and 19th. The last ten days very winterly.

WALES.

r.—January commenced fine, but on the 3rd it became stormy, and continued so until the 13th, when the sky veered to N.E., and a fine, bright, frosty period set in, which nd, when S fell, and again on 25th, covering the Precelly s the wind shifted to N.W., with heavy S and H showers, is weather prevailed to the end.

Gogerddan.—S fell on the 26th, 27th, and 28th to a depth ies.

SCOTLAND.

ries].—Although no very sudden fluctuations of temp. e month, which was uniformly cold, there was considerable ean temp. of the last 19, as compared with the first 12, days. when the thermometer was only once below freezing point, as 38°·4; from 13th to 31st, when frost was registered on 20th, the mean was 31°·8. The mean for the month is 3°·5 of 38 years. The rainfall (of which upwards of ·50 in. fell hews a great deficiency from the average, and is one of the only in the years 1880 and 1881 was less recorded. Owing frost, curlers had a merry time, but little progress was work. S on 16th, 2½ inches deep; on the 24th, 2 inches; ½ inches.

ainfall 2·99 in. below the average of 20 years. Mean temp. rage.

nonth of dreary, unsettled weather.

nford.—Gale of wind from the N. and a heavy snowstorm and 28th.

Roeberry.—A very good month, although cold, until the severe S storm came on, which continued to the end of the ap. 35°·5; 2°·5 below the average of 7 years.

IRELAND.

bey.—Rainfall below the average. Sharp frosts during the H, and a few flakes of S on 26th.

ook Lodge.—S on 15th, 17th, 22nd and 23rd. Mean temp.

t, Ross.—R much under the average. Many fine and bright of the month, with slight frosts.

ng with a brilliantly fine day, January, 1897, proved a cold, . Between the 3rd and the 10th, inclusive, there was an with S.E. winds; the weather was open at this time, but quent frosts occurred, and S fell from time to time. Mean ·3 below the average. Foggy on 9 days. High winds on 11 force of a gale on 4 days. S or sleet fell on 5 days, and H

more.—Stormy weather on 1st, 5th, 7th and 29th; strong S showers on 26th.

el.—The polar, or easterly winds, which prevailed almost ion during the month, resulted in weather which may be e severity, for although it froze on 27 nights, sometimes lay was a temperature of freezing maintained throughout. ent rainfall, and little or no snow.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIV.] MARCH, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

SUNSHINE AT KIMBERLEY, S. AFRICA.

THE numbers given below represent the results of three years' (1894-96) observations on the duration of sunshine, taken at the Meteorological Observatory maintained by the De Beers' Company at Kenilworth, near Kimberley. They may possibly interest your readers, since in magnitude they cannot be surpassed by many stations on the earth's surface. In fact one almost gets tired of the perpetual brightness of the sky, and longs for the too-much maligned "leaden" sky of England, of which, as will be seen from the tables, we get only a fortnight's experience in three years.

The quantities for each hour are expressed in minutes, only the monthly and yearly totals being reduced to hours. The number of rainy days, and the amount of rainfall, are put in for comparison. Under the heading "No. of days" will be seen two columns of numbers: the first of these gives the number of days on which a measurable quantity fell, the second all days on which any rain fell. The amounts of rain too small to measure are written ·000, in accordance with the custom followed in Natal.

Of course three years is too short a period for fruitful discussion. It is, however, perhaps worth while to point out that if the sequences hold good for ten or twenty years, then the greater the rainfall the later the hour of maximum sunshine. Attention may be called also to the winter sunshine, particularly, for example, that of July, 1896, where between the hours of X. and XI. only eight minutes of cloudy sky were registered. Indeed for that same hour, the record is only broken for ten minutes from June 17th to August 6th (inclusive)—fifty days.

The instrument used is a Jordan Photographic Recorder, by Negretti & Zambra, of the twin semi-cylinder pattern. The record is measured after a development (for as near as possible fifteen minutes) in rain water—that is, when rain water can be obtained. When there is no rain water, river (Vaal) or spring water has to be used. I do not fancy that the different waters make any difference in the result. River and spring waters certainly bleach the charts

(*Continued on page* 20.)

Kimberley Sunshine, 1894 *and* 1895. *Taken with a Jordan Recorder (twin semi-cylinder pattern).*

	V	VI	VII	VIII	IX	X	XI	NOON	I	I	III	IV	V	VI	VII	Month		Rainfall.		
1894.																	No. of days without Sunshine.	No. of days		Inches.
	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours	mins			
Jan.	614	1234	1258	1434	1334	1327	1393	1447	1478	1355	1228	1154	1030	490	279	36	2	13	14	7·29
Feb.	113	763	854	911	906	970	1008	1059	999	1085	975	837	702	142	188	44	3	10	11	5·35
March	9	1098	1494	1477	1526	1539	1398	1375	1197	1159	1170	1175	818	1	257	16	1	14	15	2·32
April	...	607	1563	1522	1550	1654	1628	1497	1577	1468	1517	1456	526	...	276	5	...	7	7	1·57
May	...	85	1490	1485	1508	1501	1514	1443	1463	1396	1338	1178	35	...	240	36	1	7	7	·93
June	...	...	1223	1560	1573	1646	1679	1636	1663	1731	1727	1213	...	...	260	51	...	2	2	·06
July	...	...	1261	1755	1746	1749	1774	1755	1742	1793	1734	1272	...	...	276	21	...	...	0	·00
Aug.	...	193	1508	1679	1642	1664	1745	1743	1730	1721	1691	1456	163	...	282	15	...	1	3	·28
Sept.	...	608	1356	1523	1622	1629	1660	1634	1608	1527	1498	1588	732	...	283	5	...	5	5	·27
Oct.	94	1285	1493	1543	1521	1565	1532	1517	1514	1505	1387	1352	1186	75	292	49	...	8	10	·67
Nov.	522	1443	1609	1615	1690	1722	1699	1590	1617	1387	1283	1216	1263	484	319	0	...	8	10	3·25
Dec.	732	1463	1517	1530	1607	1548	1518	1475	1438	1414	1298	1246	1165	655	310	6	...	9	14	2·52
Totals...	2,084	8,779	16,626	18,034	18,225	18,514	18,548	18,171	18,026	17,541	16,846	15,143	7,620	1,847	3266	44	7	84	98	24·51

1895.																	No. of days without Sunshine.	No. of days		Inches.
	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours.	mins				
Jan.	734	1513	1639	1644	1644	1631	1575	1534	1381	1418	1443	1311	1283	591	322	21	...	8	12	·93
Feb.	243	1094	1193	1231	1304	1316	1375	1351	1247	1275	1172	1024	946	236	250	7	1	14	16	3·53
March	13	753	1187	1209	1343	1188	1222	1196	1139	1210	1171	1042	760	5	223	58	...	14	19	1·94
April	...	417	1184	1420	1496	1456	1459	1306	1435	1424	1305	1151	382	...	240	35	1	11	11	3·46
May	...	45	1248	1598	1727	1770	1730	1696	1744	1696	1654	1355	96	...	272	39	...	7	7	1·30
June	...	2	1257	1656	1695	1721	1729	1773	1730	1739	1721	1188	...	...	270	11	...	...	1	·00
July	...	...	1140	1568	1744	1785	1732	1690	1717	1677	1715	1109	3	...	264	40	...	1	1	·21
Aug.	...	114	1462	1712	1808	1761	1786	1789	1798	1761	1713	1500	212	...	289	56	...	...	1	·00
Sept.	...	784	1586	1683	1715	1676	1694	1662	1722	1702	1600	1613	835	...	304	32	...	1	2	·02
Oct.	36	1242	1551	1621	1715	1709	1584	1488	1558	1582	1469	1510	1244	52	306	1	...	4	6	·08
Nov.	361	1391	1416	1389	1407	1425	1358	1429	1347	1439	1350	1265	1148	310	283	55	1	10	10	1·79
Dec.	651	1360	1594	1623	1571	1543	1515	1423	1450	1359	1203	1302	1325	562	308	1	...	11	14	2·34
Totals...	2,038	8,715	16,457	18,354	19,169	18,981	18,739	18,337	18,268	18,282	17,516	15,370	8,234	1,756	3336	56	3	81	100	15·60

Kimberley Sunshine, 1896. *Taken with a Jordan Recorder (twin semi-cylinder pattern).*

1896.	V	VI	VII	VIII	IX	X	XI	NOON	I	II	III	IV	V	VI	VII	Month.		No. of days without Sunshine.	Rainfall.		
	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours.	mins		No. of days		Inches.
Jan.	478	1374	1450	1583	1549	1565	1550	1521	1410	1336	1231	1113	967	421	292	28	...	11	14	1·48
Feb.	184	1245	1335	1391	1343	1411	1370	1262	1191	1199	1270	1105	990	173	257	49	...	7	13	·98
March	10	1033	1458	1444	1506	1534	1494	1436	1356	1220	1258	1024	578	9	256	0	...	14	18	2·74
April	...	300	1290	1343	1433	1415	1409	1381	1483	1359	1256	1176	256	...	235	1	2	11	12	2·98
May	...	...	1097	1450	1547	1613	1523	1574	1653	1623	1538	1168	13	...	246	39	...	7	9	2·25
June	...	...	862	1390	1405	1417	1358	1431	1438	1483	1349	740	...	...	214	33	1	6	8	·56
July	...	5	1323	1785	1840	1852	1831	1831	1850	1829	1747	1194	7	...	284	54	...	...	...	...
Aug.	...	131	1331	1545	1586	1711	1709	1661	1670	1621	1536	1182	95	...	262	58	...	4	4	·43
Sept.	...	632	1613	1713	1710	1691	1690	1680	1633	1621	1650	1589	527	...	295	49	...	...	2	·00
Oct.	45	1291	1597	1745	1750	1701	1620	1609	1562	1454	1394	1334	937	38	301	17	...	4	7	·25
Nov.	342	1236	1351	1455	1516	1479	1382	1453	1450	1283	1311	1102	1055	272	278	7	...	10	11	·98
Dec.	530	1181	1120	1254	1453	1425	1291	1206	1097	1026	986	939	828	301	243	57	1	16	17	8·42
Totals...	1,589	8,428	15,827	18,098	18,638	18,814	18,227	18,045	17,793	17,054	16,526	13,666	6,253	1,214	3169	32	4	90	115	21·07

more; but rain water gives them a much cleaner and brighter appearance.

The exposure is good. The horizon is scarcely broken, save here and there by a "tailings" heap and a few inevitable gum trees. These last though are not of much account, since they tend to turn their leaves edgewise to the sun, and throw very little shadow.

No correction has been made for refraction, or for the want of actinic power in the sunlight when the sun is low and the atmosphere more or less dusty.

The rain-guage is an eight-inch, of the Meteorological Office pattern, mounted with its rim three feet above ground, the receiving chamber being protected from the rays of the sun by a stout wooden box.

Our position is—

Lon. 24° 27′ E. Lat. 28° 42′ S.

Altitude about 3,900 feet.

J. R. SUTTON, B.A.

The Kenilworth Observatory, Kimberley, S. Africa.

Mr. W. Ellis, F.R.S., has very kindly calculated the percentage of the possible duration, which the results given in the foregoing tables represent :—

Kimberley.—Percentage of Sunshine.

	1894.		1895.		1896.
January	66	.....	76	.....	69
February	52	.....	69	.....	68
March	68	.....	59	.....	68
April	81	.....	71	.....	69
May	73	.....	83	.....	75
June	84	.....	87	.....	69
July	85	.....	82	.....	88
August	82	.....	85	.....	77
September	79	.....	85	.....	83
October	74	.....	77	.....	76
November	79	.....	70	... ..	69
December	72	.....	72	.....	57
The Year	74	.....	76	.....	72

THE TEMPERATURE OF FEBRUARY, 1897.

THE weather of the latter part of February, 1897, was marked by unusual and almost unprecedented mildness, and we have searched our own record at Camden Square, which now extends over nearly 40 years, for comparable periods in the past.

Taking the month as a whole we find nothing very exceptional:—

The mean 9 a.m. temp., 42°·6, has been exceeded in 6 years, the highest being 45°·8 in 1869.

The absolute max., 58°·0, has been exceeded in 7 years, the highest being 62°·5 in 1868,

The average max., 48°·4, has been exceeded in 8 years, the highest being 51°·7 in 1869.

The absolute min., 27°·9, has been exceeded in 6 years, the highest being 31°·4 in 1872.

The average min., 39°·0, has been exceeded in 3 years, the highest being 40°·6 in 1869.

From the above we see that the month, notwithstanding its being decidedly warm, shows no very exceptional value, though the average min. is as high only once in 13 years.

Turning now to the warm period towards the end of the month, we find that for ten consecutive days, from 18th to 27th, the absolute max. was 50° or higher, For 8 consecutive days, from 19th to 26th, the 9 a m. and 9 p.m. temperatures were above 45°, and for the 8 days, 20th to 27th, the min. were above 40°, while for the 9 consecutive days, 19th to 27th, the mean temp. was 48°·2, and above 45° each day.

The following table gives the readings and the means for this period :—

TABLE I.—*Shade Temperature at Camden Square, London, February 19th to 27th*, 1897.

DATE.	9 A.M.	9 P.M.	MAX.*	MIN.	MEAN 9 A.M. 9 P.M. M. and m.
	°	°	°	°	°
19th	46·4	48·9	50·1	39·3	46·2
20th	47·2	46·3	53·7	46·2	48·4
21st	45·6	46·2	51·6	43·6	46·7
22nd	50·1	51·8	57·0	44·6	50·9
23rd	45·1	46·6	53·4	44·3	47·4
24th	46·7	46·7	50·0	45·3	47·2
25th	48·4	50·4	52·2	46·1	49·3
26th	51·9	48·2	58·0	48·4	51·6
27th	44·8	42·0	52·8	43·8	45·8
Average ...	47·4	47·5	53·2	44·6	48·2

* The Max. Temp. on the 18th was 53° 3.

The conditions shown in this table are far eclipsed by 1869, when from Jan. 28th to Feb. 17th—a period normally considerably colder—the mean temp. averaged 48°·3; and during the whole 21 days there were only 3 with a mean below 45°; the only element in which the 9 days of 1897 exceeds the 21 days of 1869 being the average min., 44°·6 for the former and 43°·3 for the latter.

This period of 1869 is so remarkable that we give the whole of the readings in Table II. :—

TABLE II.—*Shade Temperature at Camden Square, London, January 28th to February 17th,* 1869.

DATE.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN 9 A.M. 9 P.M. M. and m.
	°	°	°	°	°
Jan. 28...	47·2	49·5	53·8	37·6	47·0
,, 29...	46·8	45·5	51·9	46·2	47·6
,, 30...	44·0	49·5	52·7	40·4	46·7
,, 31...	52·6	53·1	56·3	43·0	51·2
Feb. 1...	52·8	49·0	55·1	51·2	52·0
,, 2...	44·0	40·8	49·2	42·4	44·1
,, 3...	48·4	51·2	55·0	33·9	47·1
,, 4...	53·0	49·8	57·2	43·5	50·9
,, 5...	50·2	48·2	60·8	45·8	51·3
,, 6...	48·2	46·2	57·8	42·8	48·8
,, 7...	52·3	50·0	53·7	42·5	49·6
,, 8...	53·2	53·0	54·0	48·8	52·2
,, 9..	49·8	46·5	50·8	47·6	48·7
,, 10...	50·5	51·8	55·7	44·6	50·6
,, 11...	54·0	48·7	56·4	49·8	52·2
,, 12...	42·0	37·8	50·8	41·9	43·1
,, 13...	40·1	42·8	48·8	32·0	40·9
,, 14...	46·5	48·8	50·5	38·6	46·1
,, 15...	47·2	46·3	49·2	45·6	47·1
,, 16...	47·6	50·9	52·4	43·9	48·7
,, 17...	50·8	46·2	53·6	46·8	49·4
Average ...	48·6	47·9	53·6	43·3	48·3

Selecting the warmest 9 consecutive days in Feb. 1869 and comparing them with the 1897 means at the foot of Table I., we have—

		9 a.m.	9 p.m.	Max.	Min.	Mean Temp.
		°	°	°	°	°
1869.	Feb. 3–11.	51·1	49·5	55·7	44·4	50·2
1897.	Feb. 19–27.	47·4	47·5	53·2	44·6	48·2
Excess in 1869.	... ...	3·7	2·0	2·5	—	2·0
Excess in 1897.	... ...	—	—	—	0·2	—

showing higher values in 1869, except in the one element of min. temp. where the difference is trifling.

In the whole of the 40 Februaries over which the observations extend, we have been able to find only 5 instances of 9 warmest days in which any one component (*i.e.*, 9 a.m., 9 p.m., max. or min.)

of the mean temp. exceeded the corresponding value for 1897. These are set out in Table III., which is self-explanatory. It shows that although no year but 1869 can show a warmer nine-day period in February than 1897, one or two run it very close, notably 1877.

TABLE III.—*Warm Nine-day Periods in February.*

YEAR.	PERIOD.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN.	No. of Components higher than in 1897.
1867	12th - 20th	47°4	47°6	52°7	42°9	47°6	1
1868	21st - 29th	47·8	45·6	53·9	41·9	47·3	2
1869	3rd - 11th	51·1	49·5	55·7	44·4	50·2	4
1876	15th - 23rd	48·2	47·0	52·8	43·0	47·8	1
1877	7th - 15th	48·8	47·4	53·8	42·3	48·1	2
1897	19th - 27th	47·4	47·5	53·2	44·6	48·2	...
No. of instances higher than 1897.	...	4	2	3	0	1	10

THE GALE OF MARCH 3RD, 1897.

THE damage caused by the above gale all along the south coast of England has been so fully described in the newspapers, that we do not think it necessary to dwell upon it—but the two following notes from old correspondents give details not to be found elsewhere.

To the Editor of the Meteorological Magazine.

SIR,—The gale on Ash Wednesday morning was sufficiently severe to attract your attention and investigation, so here are some notes from North Cadbury.

MARCH 2nd.—Wind rose suddenly at 3 p.m., and barometer, which had fallen slowly all morning, fell rapidly after 4 p.m.; by 10 p.m. it was down to 28·90 (aneroid).

MARCH 3rd.—4 a.m., at 28·83; 7 a.m., 28.84; rapid rise began about 8 a.m., and then the wind, which had been *strong* for the previous 17 hours, became *serious*; just before 9 it became *alarming*. S.W. overnight, it had slowly veered to due W. and there it stuck. It had rained off and on from the said 3 p.m., pretty continuously though, and now began to snow; at 9 a.m. I went out to measure the rain (·70 in.) under great difficulties from the fury of the wind. A large elm had fallen across a road into my paddock just before. I saw a thorn go while at the rain-guage; another elm went immediately

after. Mrs. Boys saw the two elms go. I won't enumerate all the disasters, trees, chimneys, thatch, tiles, &c. But though there is no getting accurate time from anyone else, I am pretty sure that most of the damage was done, as in the Midland hurricane, in a very short time—between 9 and 9.15 a.m. It was *not* so bad as the Midland hurricane at Easton Mauduit, Northamptonshire, in 1895, but not far short of it. The general testimony of my farmers is "worst wind they ever knew."

You may be interested to learn that 17 panes of glass (nearly a square yard) in the westernmost window of the S. side of the Church were *blown outwards*. Not a scrap of glass was inside. They were *not* exposed to the wind.

I cannot tell when this glass went. Can only infer that at the time of the great blasts (9—9.15) there was diminished pressure outside the building, and so the weakest glass went.—Yours very truly.

H. A. BOYS.

North Cadbury Rectory, Bath.

To the Editor of the Meteorological Magazine.

SIR,—A terrific W.N.W. gale blew from 6.30 to 7 a.m. this morning, causing much damage to roofs and trees. The barometer (corrected to 32° and sea level) fell from 29·852 in. at 8.15 a.m. yesterday (2nd) to 28·860 in. at 2.50 a.m. this morning (as much as 0·158 in. from 5 to 6 p.m., when it was 29·289 in.), and rose to 29·620 in. at 9.17 p.m. this evening. The temperature rose from 34°·0 in the early morning of the 2nd to 49°·2 last evening, fell to 37°·2 between 9.17 and 11.40 a.m. to-day, and rose to 44°·1 since. The dry and wet bulb thermometers read 40°·6 and 39°·1, with a light W. wind and cloudy sky at 9.17 a.m.; 48°·9 and 48°·0, with a S.S.W. gale and slight rain at 9.17 p.m. yesterday; 41°·0 and 35°·3, with a W.N.W. gale and clouds at 9.17 a.m., and 39°·8 and 37°·1, with a W.N.W. breeze and clear sky at 9.17 p.m. to day. A solar halo was seen from 10 to 11 a.m. yesterday; showers fell to 1.47 p.m., rain from 2.45 to 9.25 p.m. (heavy at times from 4 to 6 p.m.), and showers after 11.5 p.m. yesterday, with H. and S. to-day and L. about 1 a.m.; 1·00 in. fell in 12 hours ending 9.17 p.m. yesterday, 0·07 in. more up to 9·17 a.m. to-day, and 0·04 in. to 9 p.m. A heavy S. gale blew from 7 to 7.30 p.m. yesterday, which veered to S.W. and lulled at 10 p.m., but rose again in the early morning and veered to W.N.W. at 6.30 a.m., and blew very hard till 8 a.m. to-day.—Yours truly,

EDWIN E. GLYDE.

Rose Villa, Tavistock, March 3rd, 1897.

THE HEREFORD EARTHQUAKES.

We have just found in a privately printed paper by H. Lawson, F.R.S., the following remarkable confirmation of our suggestion as to the frequency of Hereford earthquakes—

1841.—"An unusual phenomenon in this part of England occurred in Hereford on the morning of the 25th of January, when about 3 o'clock the shock of an earthquake was sensibly felt in Castle Street, Harley Court, the High-town and Bewell Street, and produced the emotion of fear in all those who felt it, *viz.*, eight persons. It was spoken of by them as causing an indescribable sensation, accompanied by the apparent tilting of the bed on which they were lying. The wind was still and about N.W.; and freshened about half an hour afterwards, when a considerable fall of snow followed. At the same hour in the neighbourhood of Carmarthen a very smart shock of an earthquake took place."—H. LAWSON, F.R.S.

ROYAL METEOROLOGICAL SOCIETY.

AT the meeting of this Society on Wednesday evening, Feb. 17th, Mr. Edward Mawley, F.R.H.S., President, read a report on the "Phenological Observations during the Past Year." He showed that throughout the flowering season wild plants came into bloom much in advance of their usual time, and were, as a rule, earlier than in any year since 1893. The wealth of blossom on nearly all kinds of trees and shrubs was a noteworthy feature of the spring and early summer, while the abundance of wild fruits in the autumn was even more exceptional. From an agricultural and horticultural point of view the one great drawback of the year, which must otherwise have proved one of the most bountiful on record, was a drought that lasted almost without break—at all events, as far as vegetation is concerned—from March to September. The wheat crop proved the largest and best for many years, while there was a good yield of barley and potatoes. The small fruits were also good. With these exceptions, all the farm and garden crops were more or less indifferent, the crop of hay being particularly scanty.

The Hon. Rollo Russell gave the results of some observations on "Haze and Transparency," which he had made at Haslemere, in Surrey. From these it appears that the clearest hours at a good distance from towns are from about noon to 3 p.m. The clearest winds at Haslemere are those from S. to N.W. inclusive, and especially W.S.W., W., and W.N.W; the haziest are those between N. and E. On bright mornings, with a gentle breeze or calm, from autumn to spring, the haze of fog which has lain on the low ground, frequently covers the hills in the course of its ascent a few hours after sunrise. At any distance within 100 miles of London, or of the Black Country, observations requiring clear views are likely to be interfered with, when the wind blows from their direction, and should therefore be taken early.

SEISMOLOGICAL SURVEY OF THE WORLD.

WE have been reqnested to insert the following circular, so that this important undertaking may be generally known. The invitations for assistance have, we understand, been in many cases forwarded by the Foreign Office, and by the Colonial Office. Obviously, it is desirable that all parts of the earth should be represented, and it is not necessary or expedient that the observatories should be near one to another.—ED.

British Association for the Advancement of Science.

SEISMOLOGICAL COMMITTEE.

Lord KELVIN, F.R.S.
Professor W. G. ADAMS, F.R.S.
Dr. J. T. BOTTOMLEY, F.R.S.
Sir F. J. BRAMWELL, Bt., F.R.S.
Professor G. H. DARWIN, F.R.S.
Mr. HORACE DARWIN.
Major L. DARWIN.
Dr. C. DAVISON, *Secretary.*
Mr. G. F. DEACON.
Professor J. A. EWING, F.R.S.
Professor C. G. KNOTT.
Professor G. A. LEBOUR.
Professor R. MELDOLA, F.R.S.
Professor J. MILNE, F.R.S., *Sec.*
Professor J. PERRY, F.R.S.
Professor J. H. POYNTING, F.R.S.
Dr. ISAAC ROBERTS, F.R.S.
Mr. G. J. SYMONS, F.R.S., *Chairman.*

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,
BURLINGTON HOUSE,
LONDON, W.

SIR,—It has been established that the movements resulting from a large earthquake originating in any one portion of our globe can, with the aid of suitable instruments, be recorded at any other portion of the same; therefore, the Seismological Investigation Committee of the British Association are desirous of your co-operation in an endeavour to extend and systematize the observation of such disturbances.

Similar instruments should be used at all stations; and the one recommended by this Committee as being simple to work, and one that furnishes results sufficiently accurate for the main objects in view is indicated in the accompanying report (see pp. 2—4) by the letter M, a sketch of the same is shown on p. 7, whilst there is an example of one of its records on p. 49.

We desire to know whether you are disposed to purchase, and make observations with, one of these instruments, the cost of which, including photographic material to last one year, packed for shipment, is about £50. Should you reply in the affimative, we shall be pleased to arrange with a competent maker for the construction of an instrumeut for you, and to furnish instructions respecting installation and working. In case an instrument be established at your observatory, we should ask that notes of disturbances having an earthquake character be sent to us for analysis and comparison with the records from other stations. From time to time the results of these examinations would be forwarded to your observatory.

The first object we have in view is to determine the velocity with which motion is propagated around or possibly *through* our earth. To attain this, all that we require from a given station are the times at which various phases of motion are recorded; for which purpose, for the present at least, we consider that an instrument recording a single component of horizontal motion to be sufficient. Other results which may be obtained from the proposed observations are numerous.

The foci of submarine disturbances, such for example as those which from time to time have interfered with telegraph cables, may possibly be determined, and a new light thrown upon changes taking place in ocean beds.

The records throw light upon certain classes of disturbances now and then noted in magnetometers, and other instruments susceptible to slight movements, whilst local changes of level, some of which may have a diurnal character, may, under certain conditions, become apparent.

Trusting that you will find it possible to co-operate in this endeavour to extend our knowledge of the earth on which we live,

We remain, Sir,

(On behalf of the Commmittee),

Your obedient servants,

G. J. SYMONS, *Chairman.*

C. DAVISON, J. MILNE, } *Joint Honorary Secretaries.*

It is requested that Replies be addressed to—

THE SEISMOLOGICAL COMMITTEE, BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

PHENOMENAL WEATHER IN VICTORIA.

DR. ARGYLE, writing from Melbourne, on the 17th of January, to his uncle in Tamworth, says, "Our climate, at which we growl quite as much as you do in England, has gone quite mad, I think. The temperature on Thursday week was 101 deg. in the shade and terribly oppressive. On Saturday and Sunday there was a terrific storm, the thermometer dropped nearly 60 deg., and we had 4½ inches of rain in 48 hours. (This in January, usually our driest and hottest month.) To-day it has been hailing and is bitterly cold, but the sun has now come out, and I should not be surprised if it turned out hot again to-morrow. We also had an interesting phenomenon about a fortnight ago; there was a heavy fall of rain, which was full of a red dust, and the next morning the whole landscape was red. The "rain of blood," it was called, and really it looked like it. The funny thing was that it occurred on a public holiday and on a hot day, so that all the holiday-makers who were caught in it had their clothes stained a deep red, and as many people were dressed in white, you may guess what they looked like."—*Tamworth Herald*, 27th Feb., 1897.

ELECTRIC TREES IN DAKOTA.

ON January 4th, during the worst of the great wind and snowstorm at Huron, the air was heavily laden with electricity. The cottonwood trees in front of the Chicago and North-western offices presented a very strange and novel appearance. The trees were buried in snow almost to their tops, but at the end of each twig on every branch in sight was an electrical spark about as large as a common field Pea. On taking hold of a twig the spark extinguished, but on withdrawing the hand the spark reappeared. Dispatcher Wilson, who wore a glove with a hole in the thumb, took hold of a twig, and the spark transferred itself to his thumb and back to the twig when he let go. There was no shock experienced, says an American contemporary, in handling the twigs, and the light did not waver or tremble, but was quite steady. The trees looked as if a colony of fireflies had settled upon them for the purpose of an illumination.—*Journal of Horticulture*, March 4th.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	71·9	8	39·6	21	64·2	51·5	51·6	82	114·1	35·3	5·51	22	6·8
Malta	91·1	5*a*	60·6	29	82·7	68·6	66·0	74	143·7	53·5	·00	0	3·8
Mauritius	79·0	28	60·2	15*b*	76·3	64·7	60·1	73	126·7	48·8	1·15	8	4·7
Calcutta	93·0	10	72·7	30	88·3	77·8	76·8	83	157·9	71·8	9·05	10	8·3
Bombay	90·9	29	75·0	18	86·6	77·6	74·7	78	143·7	69·8	1·62	9	4·7
Ceylon, Colombo	89·2	26	72·8	10	86·9	77·1	73·6	81	149·0	69·8	10·99	23	6·6
Melbourne	75·8	11	36·8	30	61·4	44·0	43·4	71	132·2	28·1	1·93	12	5·6
Adelaide	80·4	15	40·7	17*c*	67·1	46·2	45·0	68	135·0	28·7	·45	12	4·3
Sydney	78·0	13	44·6	26	64·9	51·0	44·2	70	130·9	35·3	·52	14	3·6
Wellington	63·5	7	37·0	30	57·9	46·4	44·6	76	125·0	29·0	4·57	18	4·9
Auckland	68·0	11	44·5	23	61·4	50·8	47·7	74	124·0	40·0	4·51	19	5·8
Jamaica, Kingston	92·9	8	72·1	22	89·1	74·8	72·9	76	...	...	2·92	12	...
Trinidad	92·0	14	68·0	8*d*	88·6	72·1	73·9	83	168·0	66·0	6·46	15	...
Grenada	86·4	15	71·0	8	83·7	74·9	71·6	73	154·4	...	8·49	26	4·6
Toronto	86·3	11	27·6	23	66·5	48·0	51·5	79	96·0	21·8	5·09	15	5·5
New Brunswick, Fredericton	85·7	11	27·0	24	64·2	42·3	49·0	77	...	...	7·02	11	5·2
Manitoba, Winnipeg	78·6	23	20·0	21	62·0	38·4	...	...	...	...	1·96	10	6·5
British Columbia, Esquimalt	69·9	4	37·7	26	61·1	44·5	48·4	86	...	...	1·52	5	8·8

a—and 21. *b*—and 22. *c*—and 20, 25. *d*—and 19.

Remarks.

Malta.—Adopted mean temp. 74°·7, or 0°·4 below the average. Mean hourly velocity of wind 8·6 miles. Average temp. of sea 77°·0. Thunderstorm on 14th. Lightning on 17th and 18th. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·2 above, and rainfall ·27 in. below, their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·6 below average; extremes, 26°·2 on 6th, and 2·0 on 21st; prevailing direction, E. by S. T. F. Claxton.

Ceylon, Colombo.—Lightning was seen on the 6th, 9th 19th, 28th and 29th. Thunderstorms occurred on the 20th, 21st and 30th. A. E. Wackrill.

Adelaide.—Mean temp. 0°·5 below the average for 39 years. A very dry month, the total rainfall being ·45 in., whilst the average is 1·79 in. A very severe drought over the whole of the colony especially during the past three months. C. Todd, F.R.S.

Sydney.—Rainfall 2·63 in. below, temperature 0°·7 below and humidity 0°·5 below, their respective averages. H. C. Russell, F.R.S.

Wellington.—Showery up to the 5th, then fine to the 16th and showery for the remainder of the month, with generally strong N.W. and S.E. winds and cold weather. Slight snow on 27th and snow on the hills on 30th. Hail on 27th, 29th and 30th. Mean temp. 1°·2 above, and rainfall ·31 in. above, their respective averages. R. B. Gore.

Auckland.—Beginning and close of the month stormy, wet and disagreable; middle very fine, warm and dry. Mean temperature and rainfall much in excess of the average. T. F. Cheeseman.

Trinidad.—Rainfall 1·07 in. below the average of 30 years. J. H. Hart.

SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·04	XI.	Rhayader, Nantgwillt ...	4·19
II.	Dorking, Abinger Hall .	3·37	,,	Lake Vyrnwy	6·14
,,	Birchington, Thor	1·96	,,	Corwen, Rhug	3·09
,,	Hailsham	3·18	,,	Criccith, Talarvor..... ...	3·48
,,	Ryde, Thornbrough	3·51	,,	I. of Man, Douglas	3·62
,,	Emsworth, Redlands ...	3·38	XII.	Stoneykirk, Ardwell Ho.	2·37
,,	Alton, Ashdell	3·65	,,	New Galloway, Glenlee	4·44
III.	Oxford, Magdalen Col..	2·21	,,	Lilliesleaf, Riddell	1·73
,,	Banbury, Bloxham	2·77	XIII.	N. Esk Res. [Penicuick]	2·30
,,	Northampton, Sedgebrook	2·94	,,	Edinburgh, Blacket Pl..	1·42
,,	Duddington [Stamford].	2·95	XIV.	Glasgow, Queen's Park..	2·85
,,	Alconbury	2·37	XV.	Inverary, Newtown	7·12
,,	Wisbech, Bank House...	2·26	,,	Oban, The Corran	4·07
IV.	Southend	2·05	,,	Islay, Gruinart School ...	·91
,,	Harlow, Sheering..... ...	1·04	XVI.	Dollar.....	2·60
,,	Colchester, Lexden	2·33	,,	Balquhidder, Stronvar...	8·13
,,	Rendlesham Hall	2·23	,,	Ballinluig	1·99
,,	Rushall Vicarage	2·17	,,	Dalnaspidal H.R.S.....	5·49
,,	Swaffham	2·34	XVII.	Keith H.R.S.....	·56
V.	Salisbury, Alderbury ...	3·42	,,	Forres H.R.S.	·62
,,	Bishop's Cannings	3·10	XVIII.	Fearn, Lower Pitkerrie..	·66
,,	Blandford, Whatcombe .	4·11	,,	N. Uist, Loch Maddy ...	4·28
,,	Ashburton, Holne Vic...	3·76	,,	Invergarry.....	6·50
,,	Okehampton, Oaklands.	4·82	,,	Aviemore H.R.S.	1·56
,,	Hartland Abbey	5·45	,,	Loch Ness, Drumnadrochit	2·42
,,	Lynmouth, Glenthorne.	4·01	XIX.	Invershin	1·00
,,	Probus, Lamellyn	4·81	,,	Scourie	3·40
,,	Wellington, The Avenue	4·25	,,	Watten H.R.S.....	·88
,,	Wincanton.....	4·32	XX.	Dunmanway, Coolkelure	6 75
VI.	Clifton, Pembroke Road	3·59	,,	Cork, Wellesley Terrace	2·74
,,	Ross, The Graig	2·19	,,	Killarney, Woodlawn ...	4·15
,,	Wem, Clive Vicarage ...	2·07	,,	Caher, Duneske	...
,,	Cheadle, The Heath Ho.	3·14	,,	Ballingarry, Hazelfort...	1·78
,,	Worcester, Diglis Lock	2·34	,,	Limerick, Kilcornan ...	1·22
,,	Coventry, Kingswood ...	3·59	,,	Broadford, Hurdlestown	1·62
VII.	Grantham, Stainby	3·92	,,	Miltown Malbay	3·35
,,	Horncastle, Bucknall ...	2·67	XXI.	Gorey, Courtown House	1·98
,,	Worksop, Hodsck Priory	3·03	,,	Athlone, Twyford	2·42
,,	Neston, Hinderton	2·07	,,	Mullingar, Belvedere ...	3·35
VIII.	Southport, Hesketh Park	2·51	,,	Longford, Currygrane...	2·54
,,	Broughton-in-Furness ...	3·51	XXII.	Woodlawn	2·86
IX.	Ripon, Mickley.....	2·70	,,	Crossmolina, Enniscoe ..	4·65
,,	Melmerby, Baldersby ...	1·90	,,	Collooney, Markree Obs.	3·30
,,	Scarborough, Observat'y	1·92	,,	Ballinamore, Lawderdale	3·20
,,	Middleton, Mickleton ...	2·17	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	2·85	,,	Warrenpoint.....	2·16
,,	Bamburgh	·88	,,	Seaforde..	2·53
,,	Keswick, The Bank.....	4·49	,,	Belfast, Springfield	2·47
XI.	Llanfrechfa Grange	3·72	,,	Bushmills, Dundarave..	2·37
,,	Llandovery	4·78	,,	Stewartstown	2·86
,,	Castle Malgwyn	2·77	,,	Killybegs	5·32
,,	Builth, Abergwesyn Vic.	6·60	,,	Lough Swilly, Carrablagh	3·31

FEBRUARY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·75	+ ·87	·59	4	14	58·0	26	27·9	8	2	9
II.		Maidstone (Hunton Court)....	2·32	+ ·52	·85	1	10	...	...	...	...	...	...
,,		Strathfieldsaye	3·84	...	·78	4	15	...	...	...	...	...	...
III.		Hitchin	2·34	+ ·59	·46	5	16	56·0	26	28·0	7	7	...
,,		Winslow (Addington)	2·60	+ ·44	·46	5	13	57·0	22	29·0	8, 18	5	10
IV.		Bury St. Edmunds (Westley)	2·33	+ ·77	·58	5	14	56·0	26	28·0	3	..	..
,,		Norwich (Brundall)	2·17	...	·58	5	18	57·8	26	27·4	3	6	12
V.		Weymouth(LangtonHerring)	4·43	+ 1·83	1·29	4	17	53 0	14*b*	32·0	1	1	...
,,		Torquay (Cary Green)	2·98	...	·79	4	15	56·4	29*c*	35·0	1, 17	0	1
,,		Polapit Tamar [Launceston]...	3·94	+ ·67	·75	1	18	53·4	23	30·0	15	3	8
VI.		Stroud (Upfield)	2·94	+ ·38	·54	19	17	56·0	22	33·0	1 & 2	0	...
,,		ChurchStretton(Woolstaston)	2·39	— ·06	·35	1	17	58·0	23	31·0	2*e*	8	15
,,		Tenbury (Orleton)	2·21	— ·27	·39	1	12	61·5	22	26·8	28	3	11
VII.		Leicester (Barkby)	2·78	+ ·97	·96	5	18	57·0	26	24·0	27	11	18
,,		Boston	2·90	+ 1·22	·76	4	15	52·0	26	27·0	12	9	...
,,		Hesley Hall [Tickhill].....	2·68	+ 1·18	·86	5	17	57·0	26	25·0	12	11	...
VIII.		Manchester(PlymouthGrove)	2·39	+ ·34	·42	1	19	54·0	28	27·0	6	5	7
IX.		Wetherby (Ribston Hall) ..	1·24	— ·34	·60	6	4	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·81	+ 1·12	1·28	25	17	..	...	...	...	...	...
,,		Hull (Pearson Park).	2·53	+ ·73	·72	5	15	59·0	26	25·0	1	11	18
X.		Newcastle (Town Moor)	1·13	— ·27	·30	5	11	...	..	...	...	...	...
,,		Borrowda Seathwaite).....	12·42	— ·22	2·68	8	19	...	...	...	...	...	...
XI.	WALES.	Cardiff Bay	4·79	+ 1·60	·65	4	22	...	...	...	...	...	...
,,		Haverfordwest	3·52	— ·60	·62	18	23	52·9	26	29·7	28	2	8
,,		Aberystwith (Gogerddan) ...	4·96	+ 1·70	·58	19	21	51·0	10	...	..	...	...
,,		Llandudno.....	2·37	+ ·45	·30	1	20	55·0	26	34·5	1	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·63	— ·02	·78	24	14	57·6	22	25·0	12	8	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.		Colmonell	2·63	...	·51	28	18	56 0	19	26·0	11	...	...
XV.		Lochgilphead (Kilmory)	4·02	— 1·17	·77	24	18	...	...	24·0	9	5	...
,,		Mull (Quinish).....	3·30	— 2·17	·66	4	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·40	— ·35	1·00	26	11	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·85	— 1·25	·35	25	14	59·5	22	25·6	3	9	...
XVII.		Braemar	1·52	— 1·84	·42	25	11	54·0	22	—7·0	4	12	16
,,		Aberdeen (Cranford)	·60	...	·20	28	13	...	...	7·0	3	16	...
,,		Cawdor (Budgate)	·98	— 1·25	·21	25	11	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	3·95	— ·76	1·07	26	10	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·32	...	1·37	25	21	52 5	19	17·9	4	12	...
XIX.		Dunrobin	1·22	— ·87	·32	20	11	56·0	23	20·0	4	10	...
,,		S. Ronaldsay (Roeberry).....	1·50	— 1·14	·19	25	20	50·0	22*d*	21·0	8	12	...
XX.	IRELAND.	Darrynane Abbey.....	4·12	...	·39	12	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·13	— 1·95	·37	3	18	57·0	22	31·0	28	1	...
,,		O'Briensbridge (Ross)	2·73	...	·49	24	22	..	...	...	...	...	...
XXI.		Carlow Browne Hill)	1·80	— 1·28	·21	8*a*	16	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·40	— ·95	·27	2	16	59·7	19	35·0	1	0	...
XXII.		Ballinasloe	2·44	— ·34	·46	1	22	54·0	25	31·0	25	2	...
,,		Clifden (Kylemore)	5·63	...	·94	24	22	...	...	...	...	...	...
XXIII		Waringstown	2·43	— ·02	·34	4	18	57·0	25	28·0	11	5	13
,,		Londonderry (Creggan Res.).	2·97	— ·06	·50	24	22	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·42	+ ·73	·64	8	19	54·0	25	30·0	11	3	...

+Shows that the fall was above the average ; —that it was below it.

a—and 24. *b*—and 26. *c*—and 22. *d*—and 23, 25 and 26. *e*—3 and 18.

METEOROLOGICAL NOTES ON FEBRUARY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

ADDINGTON.—The heavy rainfall on the first five days of the month, helped by the rainfall of the last four days of January, caused very large and continuous floods, the meadows being covered with water to a very wide extent for a longer time than usual. A very thick fog on the 23rd; high wind on the 24th, 25th and 26th. Weather generally dull.

BURY ST. EDMUNDS, WESTLEY.—A mild month, the latter part very fine and favourable for agriculture. Vegetation forward.

NORWICH, BRUNDALL.—The earlier part of the month was rainy and sunless; the latter part bright, and some days were unusually warm for the season. A heavy fall of S occurred at night on 1st, the ground being covered for four days. Fog on 3rd. Floods on marshes on 7th. Gale from 4 a.m. to 6 a.m. on 21st; some gusts very violent.

WEYMOUTH, LANGTON HERRING.—The month was very mild throughout; from the 1st to the 13th no less than 3·69 in. of R fell. With the exception of 1881 and 1883, when 4·76 in. and 4·73 in. fell respectively, the wettest February in 23 years. The average temp. at 9 a.m., 43°·7, is 4°·5 above the average, and the highest since 1877, when it was 44°·0. February, 1897, and February, 1895, compared, show a striking difference:—

	Average, 9 a.m.	Min.	Max.
1897	43°·8	40°·5	48°·2
1895	27°·0	23°·7	33°·8

Fogs occurred on 10 days (some of them dense) in the first half of the month. February was without frost, the 32° registered on the 1st being the temp. of the evening of January 31st.

TORQUAY, CARY GREEN.—Rainfall ·46 in. above the average; mean temp. 46°·6, or 3°·6, above the average. Duration of sunshine 52 hours, being 26 hours 45 minutes below the average; 11 sunless days.

POLAPIT TAMAR [LAUNCESTON].—A very wet and unseasonably warm month. Exactly seven inches of rain has fallen during the two months of the year, compared with 1·89 in. for the corresponding period of 1896.

STROUD, UFFIELD.—S.W. gale on 26th. Wind S.W. on 15 days, S.E. on 4 days, and N.W. on 7 days.

WOOLSTASTON.—A seasonable month, with no extremes of temp. S fell on the 2nd. Mean temp. 42°·3.

TENBURY, ORLETON.—The first five days were very wet and damp, with a large amount of fog; but afterwards the weather was fine, with a large percentage of sun. From the 13th to the end of the month the temp. reached 50° on every day, and the mean temp. of the month is more than 3°·5 above the average. S about two inches deep on 2nd.

LEICESTER, BARKBY.—Warmth above average. Very high winds during the last week. Mean temp. 41°·2.

WALES.

HAVERFORDWEST.—One of the most gloomy, foggy and wet Februaries ever registered here, although the rainfall was never at any time large. There was very little frost and there were no gales of any magnitude. Lunar halos were

Fog occurred on 18 days and the wind blew
The readings of the bar. were remarkably high
id again on the 21st, 22nd, and 23rd. Highest
m. on the 22nd.

—Very stormy throughout the month and very

SCOTLAND.

ıonth was characterized by constant atmospheric
slightly above the average of 38 years while the
mean for that period. Exactly the contrary
ıt half of the month was very much colder than
ıe first thirteen days being 36°·5 and from 14th
ed by the maximum on the 22nd, 57°·6, has been
eing registered on 20th February, 1891, and
One inch of S fell on the 3rd. During the
violent S.W. gale was experienced and a fresh
ılew on the 25th. Though compared with last
fair start has been made in spring growth, and
ıarance, farm work, however, has been much re-
ng the latter half of the month.

n. below, mean temp. 3°·8 above, the average of

ion of the extreme frost on 3rd and 4th, *viz.*, 2°
y fine month.

ı last two weeks of the month were warm, the
ɔ 59°.

The first half of the month was cold and windy,
Mean temp. 38°·2.

IRELAND.

mild month with much mist and fog.

ɔ temperature of the month was much above the

this was one of the mildest Februaries on record
ıny frost even on the ground, and the sky was
irst third of the month was gloomy and wet.
ıt during the greater part of the month. The
'e the average. Neither Hail, Sleet nor S fell.
above average. High winds were noted on 7
gale on the 18th, 20th, 24th, 25th and 26th. A

able February with as a rule dull, dark weather.
both rather over the average and atmospheric

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young*, on "*Two Years' progress in Astronomy.*"

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 15s.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXV.] APRIL, 1897. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE FIRST DAILY WEATHER MAP.

IN our number for September, 1896, we gave a photographic reproduction of the first daily weather map ever published, and promised to give its history as soon as we had concluded our enquiries.

Perhaps it is rash even now to assume that these enquiries are complete, for completeness is rarely attainable, and the publication of this note may lead to some fresh facts being brought to our notice—if so, so much the better, and we will insert them in a subsequent number.

As far as we can trace the facts they are as follow :—

In 1849 the proprietors of the *Daily News* decided upon collecting and publishing daily reports of the direction and strength of the wind and of the state of the weather. The organization was entrusted to Mr. Glaisher, F.R.S., who received from the various companies a pass over nearly every railway in the country, which enabled him to fix the compass points and instruct the clerks at each station, and, either then or subsequently, to erect barometers at many of them, all, we believe, with the hearty co-operation of the Electric Telegraph Company, the cost being borne partly by Mr. Glaisher, partly by the *Daily News*. The issue of that journal for June 14th, 1849, contained the first fruits of this enterprise, in the shape of the earliest telegraphic Weather Report known to us.

During the subsequent two years the system was greatly developed ; the Electric Telegraph Company was incorporated in 1846, and by 1851 had erected about 2,000 miles of wire, and during the great Exhibition of 1851, Mr. (now Sir George) Grove, as Secretary of the Society of Arts, decided upon issuing the information, collected by the Electric Telegraph Company, in the form of the Daily Weather Map, the lithographic production of which was entrusted to Mr. Trelawny Saunders, F.R.G.S., the first of which, for August 8th, 1851, was the one reproduced by us last September from a set kindly presented to us by H.M. Royal Commissioners of the 1851 Exhibition.

It is noteworthy that now, 46 years afterwards, all the persons chiefly concerned have assisted us in thus placing on apparently indisputable record, the history of the First Daily Weather Map.

INDEX TO VOLS. I.–XXX. OF THE *MET. MAG.*

THANKS greatly to the help of an old observer, who will not let me mention his name, the very heavy labour of preparing the Index is ended, and proofs are to be ready on April 24th.

Probably no one who ever compiled an index was satisfied with it when it was done, and I am not contented with mine. I think that many additional entries of subjects should be made from the Reviews —and of course in many thousand entries there must be mistakes.

I have always received so much help from my correspondents, that it has occurred to me that perhaps a few would not mind reading some portions of the proof, and suggesting additions and corrections. It will be easy to have a few extra proofs, and I will gladly send a copy to anyone who volunteers promptly. G. J. SYMONS.

SCIENTIFIC KITE WORK IN THE ARCTIC REGIONS.

In the *Met. Mag.* for August, 1896, Mr. Laurence Rotch directed attention to the use of Kites in Scotland, in 1749, by Dr. Wilson.

In the *Met. Mag.* for February, 1895, we mentioned that Admiral Back is reported to have used a Kite to ascertain the temperature of the upper air in the Arctic Regions in 1836–7.

We now add the record of another earlier experiment made during the winter 1822-23. It forms a foot note to the excellent article on "Meteorology" contributed to the Encyclopedia Metropolitana, by Dr. G. Harvey, F.R.S.

"We are only acquainted with a single experimental observation, made with a view of discovering the decrement of temperature in high latitudes. This experiment was performed by the Rev. George Fisher, and the intrepid navigator, Captain Sir Edward Parry, at the Island of Igloolik, in lat. 69° 21′ N., and long. 81° 42′ W,

"A paper kite was hoisted, to which was attached an excellent register thermometer, in a horizontal position. Its height above the level of the frozen sea, upon which the experiment was made, was determined by two observers in the same vertical plane, taking its altitude at the same time above the distant horizon; and thence its height was computed. The greatest height observed was 379 ft., at which it was nearly stationary for a quarter of an hour, although it had probably been more than 400 ft. above the sea. The experiment was made under very favourable circumstances, the kite being sent up and caught in coming down, without the slightest agitation. 'The indices,' says Mr. Fisher, 'had not altered their position in the slightest degree, and they would have indicated any variation of temperature, had it existed, to less than a quarter of a degree, Fahrenheit.' The temperature at the time was —24° Fahrenheit.

"Dr. Young, in alluding to this interesting experiment, remarks that the law of decrease of temperature must be supposed to be very different in the Arctic regions from that which prevails in more moderate latitudes. The inference, however, is by far too sweeping, resting as it does on a single experiment. We may hope, however, that time will make known more perfectly many of the Physical conditions of the Polar regions."—*Meteorology*, by G. Harvey, F.R.S. in the *Encyclopedia Metropolitana*, 1834, p. 73.

THE COLDEST COUNTRY IN THE WORLD.

In the new bulletin of the Royal Geographical Society of Irkutsk, Professor Sergus Kovalik gives an interesting account of "Life in the Coldest Country in the World." It is that of Werchojansk, in Siberia (Lon. 133° 51′ E., Lat. 67° 34′ N.), where the lowest temperature of —90 deg. Fah. has been observed, and the mean of January is —48 deg. Fah. It is inhabited by about 10,500 persons of the Jakut and Lamat races. In a large part of the region, according to Prof. Kovalik, the air is so dry and the winds are so rare that the intensity of the cold cannot be fully realised. In the most distant parts of the East there are sometimes terrible storms, which are most fatal to life in their consequences. During the summer time the temperature occasionally rises to 86 deg. Fah. in the shade, while it freezes at night. The latter part of this season is often marked by copious rains and extensive inundations, which invariably lay waste a vast acreage of land, and prove to be a serious obstacle to the cultivation of the soil. Vegetation is very scanty. There are practically no trees, only wide, open meadows. The people hunt fur-bearing animals, fish, and raise cattle and reindeer. It requires about eight cows to support a family, four being milked in the summer and two in the winter. The cattle are very small in size, and are fed with hay in winter. Occasionally they are allowed to go out when there is the slightest break in the weather, but their teats are always carefully covered up with felt. Milk is the principal food. This is sometimes supplemented with hares, which are quite abundant, but not very relishable. The houses are constructed of wood, covered with clay, and as a rule consist of only one room, in which the people and animals live together. The upper and wealthier classes are better provided with lodging and food. As a race they are exceedingly courteous and very hospitable, and they are excessively punctilious concerning points of honour, such as the place at table and the proper place at festivals.—*Echo.*

We may supplement this by a few Werchojansk figures from Dr. Wild's *Temperatur-verhältnisse des Russischen Reiches*:—

Monthly Mean Temperature.

	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
1869	—56·4	—54·8	—29·4	6·8	31·3	56·1	59·7	53·4	36·1	7·0	—29·4	—46·8	2·8
1871	..	..	..	..	..	..	..	..	..	..	—47·6	—53·7	..
1872	—55·8	—51·2	—28·5	..	..	..	..	..	..	..	..	..	..
Mean	—56·1	—53·0	—28·9	6·8	31·3	56·1	59·7	53·4	36·1	7·0	—38·5	—50·3	2·0

Absolute Monthly Maxima.

	—18·6	— 8·5	2·8	41·4	55·8	84·2	84·0	86·2	53·4	36·5	— 1·3	— 8·0	86·2

Absolute Monthly Minima.

	—76·0	—79·4	—67·4	—25·2	—4·0	41·2	42·4	35·6	19·2	—29·9	—56·4	—81·8	—81·8

In 1883 verified thermometers and a Stevenson screen were sent to this interesting station, and the mean temperatures from 1883 to 1887 were as follows:—

1883	..	..	..	..	..	..	..	..	..	..	—37·1	—59·4	..
1884	—64·5	—52·8	—43·2	2·7	31·1	51·3	..	..	..	..	..	—49·9	..
1885	—63·0	—50·8	—19·8	—1·7	28·0	48·4	60·1	43·5	29·1	— 2·4	—47·6	—63·0	— 3·3
1886	—64·1	—47·2	—37·3	4·5	27·7	37·9	..	..	..	— 6·5	—36·0	—58·9	..
1887	—62·9	—54·4	—21·6	9·0	40·6	59·9	53·6	..	..	..	..	..	..
Mean	—63·6	—51·3	—30·5	3·6	31·8	49·3	56·8	43·5	29·1	— 4·4	—40·2	—57·8	— 2·7

Habituated to temperatures like these, the Lamats would find the winter climate of the North Pole quite mild.

ROYAL METEOROLOGICAL SOCIETY.

DIAMOND JUBILEE MEETING AND EXHIBITION.

AT the Ordinary Meeting held on Wednesday evening, March 17th, a lecture was delivered by Mr. G. J. Symons, F.R.S., on "Meteorological Observations in 1837 and 1897." It might be thought, he said, that by merely sorting out the meteorological instruments invented prior to 1837 we should at once have a statement of what were in use at that date, but that notion was quite wrong. For example, dry and wet bulb thermometers, used synchronously as a hygrometer, were employed by Professor Boeckmann, of Carlsruhe, in 1802; they were again used (probably reinvented) by the Rev. Mr. Gordon, of Kinfauns, Perth, in 1817; and after another 19 years were brought out as a novelty by Mr. J. A. Mason in 1836; yet Mr. Symons did not know of one single station at which a dry and wet bulb hygrometer was in regular use in 1837. Therefore, the mere dates of inventions were of no help in determining the usual equipment of a meteorological station in the first year of the Queen's reign. For more than half of the period with which the paper dealt, he had not merely been collecting records of rainfall for current years, but had been searching for old records, and thus he had gradually accumulated returns for bygone years, far more numerous than those known to any one living at that time, since in 1837 postage, printing, and intercourse generally were very different from what they are now. It occurred to him that a list of the observers at work in 1837 would bring to his mind many facts that otherwise he would not think of, and the further idea arose of tabulating the rainfall for that year. This table contained perfect records from 91 stations in England, 5 in Wales, 60 in Scotland, and in 5 Ireland, together, with incomplete returns from 19 other stations, in all 180. More than half of these were merely rainfall stations, at which no records of barometer, thermometer, hygrometer, or anemometer were made. Mr. Symons proceeded to describe the instruments which he knew to have been used by good, ordinary observers in 1837, and which could have been obtained at once by any one going to the shops of the opticians of the day. He then briefly enumerated the usual forms of instruments employed at the present time, detailing the equipment of ordinary meteorological stations. Lastly, he showed what he thought might in many respects be regarded as the essence of much that had gone before, and of the marvellous progress which had characterised the Victorian reign. Thanks to the help of Mr. Scott and Mr. Gaster, he was able to exhibit in the lantern a chart showing the state of the weather over Western Europe only an hour or two before the time of the lecture. We were, he said, so used to weather maps that they did not strike us as at all a marvel, but when we looked into details they really were startling. There were records for that day from the sunny Riviera, eastwards as far as Berlin, and northwards, not only up to the top of the Gulf of Bothnia, but actually up to Bodo, within

the Arctic circle. If that did not prove the existence of a wide-spread interest in meteorological work, excellent organization, and the wonderful development of human intercourse, he did not know how otherwise it could be demonstrated.

At the conclusion of the lecture, Mr. Birt Acres, by means of a cinematoscope, exhibited some photographic studies of clouds and waves.

OUR IMPRESSIONS OF THE EXHIBITION.

The Annual Exhibition of the Royal Meteorological Society—usually held in conjunction with the Ordinary Meeting in March—was this year, in commemoration of the sixtieth year of Her Majesty's reign, devoted to a display of the instruments in use by meteorologists in 1837 and 1897.

The instruments accredited to the earlier period comprised—

6 Barometers.
10 Thermometers.
9 Hygrometers.
3 Rain Gauges.
3 Anemometers.
1 Actinometer.

Several of these would probably be excluded if the rigid limitation adopted by Mr. Symons in his descriptive lecture had been adhered to, inasmuch as one or two were undoubtedly of more recent form and construction, while others—though invented before 1837—were not in general use at the time.

The most striking characteristic of the barometers is perhaps an absence of that precision now considered requisite. No. 6 in the catalogue being a good illustration of this.

> "6. *Large Cistern Barometer.*—This instrument was made for the Meteorological Society of London in 1837 by Mr. R. C. Woods, and cost forty guineas. The proportion of the calibre of the tube to that of the cistern is as 1 : 50, a proportion which was considered sufficient to obviate the necessity for applying capacity corrections. The tube and cistern originally held 70 lbs. of mercury."

On the other hand, Morland's diagonal, or open scale barometer, was obviously designed with a view to greater accuracy in reading. We have never heard of one of these in actual use, probably owing to modern patterns attaining the desired accuracy by other means.

The thermometers show little variation from modern forms, barring a general tendency to larger bulbs and bores and consequent sluggishness; a notable exception being the Maximum, made by Prof. Phillips himself, with a bulb of quite modern smallness, but apparently with round bore and somewhat close scale.

Modern hygrometers again show little advance over those exhibited, if we assume that those dependent on a hygroscopic substance such as

catgut, swansquill, whalebone, vegetable fibre, &c., for their indications were little used for scientific records. Yet the hair hygrometer belonging to the same class is in very general use on the continent, and has, we think, been unjustly discredited in this country; for, in the recording form exhibited by Messrs. Richard Freres, it gives a beautiful trace, and is more reliable in frosty weather than are the dry and wet in the hands of the average observer.

Of dew-point hygrometers, Daniell's is capable of as great a degree of precision as any modern rival, though Dines's shows a great gain in convenience by replacing the ether by water.

Chemical hygrometers, in which a given quantity of air is deprived of its aqeous vapour by means of sulphuric acid or other substance having great affinity for moisture, were conspicuous by their absence from both sections of the exhibition, though at one time they were much commended for use by meteorologists.

Of the three rain gauges exhibited, the first ("Howard's") is in a modified form, the rain gauge of the Englishman all the world over, while the other two—the "Crosley" and the "Side tube"--are fortunately dead and buried, though we hear of an occasional case of a misguided observer reverting to these archaic forms.

May we be forgiven for saying of the next class of instruments—"Anemometers"—that the whole science of anemometry is only just emerging from a state of barbarism worthy of the middle ages. But, thanks mainly to the modern apostle of anemometry, Mr. Dines, it is emerging.

The earliest anemometer in the catalogue is Lind's, "in which the force of the wind is shown by the depression and elevation of a column of water." This is the principle adopted by Mr. Dines in his latest pattern, the pressure tube anemometer. Of the remaining anemometers we would only say—*De mortuis nil nisi bonum.*

The list of 1837 instruments terminates with Herschel's actinometer, but there is no actinometer in the 1897 list. Have meteorologists given up using this instrument, or is it the fact that they never did use it?

Of the modern instruments we have little to say, they provide a delightful display of inventive genius and high-class workmanship, and make the amateur meteorologist long for unlimited cash to purchase, and time to use, the varied apparatus designed for wresting nature's secrets from her.

The Society itself exhibited a completely equipped meteorological station, necessarily substituting green baize for grass. We noticed in front of the thermometer screen a beautifully painted footboard for the observer. Do not the instructions say that the screen should be surrounded by grass?

It would be wearisome to give even a condensed list of the exhibits, and we will content ourselves with a few which had most interest for us, freely admitting that our selection probably has little to commend it to others.

"127. *Seismograph* as arranged by Prof. J. Milne, F.R.S., for recording earthquakes, earth-tremors, &c. *Exhibited by* L. P. CASELLA, F.R.Met.Soc."

This appealed to our mechanical taste as a well designed, well arranged, and well made piece of apparatus.

"149. *Set of Meteorological Curves having reference to the gale of March 3rd*, 1897, comprising—

1. For Falmouth. Barograms, Thermogram, Anemograms, and Rainfall Curves.
2. For the Scilly Islands. Pressure Tube, Anemograms, and Aneroidogram.
3. For London. Aneroidogram with open scale.
4. Two Weather Charts showing the systems prevailing over the British Islands at 8 a.m. on March 3rd and 4th."

giving opportunity for a very interesting comparison of the various meteorological elements during a gale of exceptional severity.

"156. *Photograph showing the fixing of a 70 ft. Earth Thermometer* at Col. Knight's Observatory, Harestock, Winchester."

"138. *Case of Earth Thermometer* used at Harestock, Winchester. *Exhibited by* COL. H. S. KNIGHT, F.R.Met.Soc."

From the above, and from other information which has come to our knowledge, we believe that the problems of earth temperature have never been attacked with the same amount of thoughtful care and elaborate instrumental equipment as Col. Knight is devoting to them.

"155. *Photographs, Drawings, and Charts, illustrating the use of Kites* for obtaining meteorological records in the free air. *Exhibited by* A. L. ROTCH, F.R.Met.Soc."

Our last entry relates to a subject which remained almost dormant during the first fifty years of the Queen's reign, but is now receiving the attention which it deserves.

We must pass over numbers of beautiful photographs, only mentioning some of frost on window panes which showed charming specimens of nature's handiwork.

Mr. W. H. Dines, F.R.Met.Soc., showed an experiment illustrating the Formation of a Tornado Cloud. A tornado, waterspout, or whirlwind is one of those phenomena which cannot be seen every day, and when it does occur, observers are too often busy in securing their property, and therefore unable to study it; but by Mr. Dines's apparatus, the verisimilitude of a small tornado can be examined at leisure.

RAINFALL AT MUSWELL HILL.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall of the 7 months, Sept. 1st, 1896, to March 31st, 1897, has been so excessive, that it may be interesting to compare it with past years.

A record of R for a quarter of a century was completed there on

December 31st last; during that time, once only, just 20 years ago, has the total R for the 7 months, Sept. 1st to March 31st, exceeded that of the same period in 1896-7. In 1876-7 the aggregate for those 7 months was 24·63, being 8·09, or nearly 49 per cent. above the 25 years' average (16·54); while in 1896-7 it was 23·37, being 6·83 or 41¼ per cent. above the average.

	1872-3.	1876-7	1880-1	1882-3	1885-6	1896-7	Average for 25 years.
	in.	in.	in.	in.	in.	in.	in.
Sept. ...	1·71	3·82	3·76	3·06	4·76	6·26	2·47 .. Sept.
Oct.	5·80	1·22	5·36	5·53	3·90	3·06	3·15 ... Oct.
Nov. ...	4·09	3·46	2·11	3·10	3·67	1·12	2·80 ... Nov.
Dec.	4·79	6·63	3·40	2·91	1·22	4·05	2·41 ... Dec.
Jan.	2·66	5·01	1·29	2·50	4·72	2·23	2·14 ... Jan.
Feb.	2·38	1·80	4·03	3·95	·65	3·02	1·77 ... Feb.
March ...	1·80	2·69	2·31	·91	1·73	3·63	1·80 ... March
	23·23	24·63	22·26	21·96	20·65	23·37	16·54
Excess above Average	6·69	8·09	5·72	5·42	4·11	6·83	

During the 25 years there have been only five previous instances when the rainfall of those 7 months exceeded 20 inches, and the table appended gives the totals of each month on these occasions. In 1876-7 the excess was, in a great measure, due to the enormous amounts of December and January; while in 1896-7, September, December and March contributed most largely to the result.

Yours truly,

J. W. SCOTT.

Elleray, Etchingham Park, Finchley, N., April 3rd, 1897.

REVIEWS.

On Periodicity of Good and Bad Seasons. By H. C. RUSSELL, B.A., C.M.G., F.R.S. (Proc. R. Soc. New South Wales, June 3rd, 1896.) 8vo, 47 pages, 1 plate.

THIS paper opens with the following paragraph:—

"I feel some reluctance in coming forward to night, with the results of my investigations into the periodicity of good and bad seasons—floods and droughts if you will—because they must come to you as a surprise, and they will make a claim on your confidence, which at first sight you will probably not be disposed to grant. For myself, I know that some years ago, if anyone had come to me, stating that it was possible to forecast the seasons many years in advance, I should have received the statement with incredulity. It will not be a surprise to me therefore if you feel the same, but I hope you will give a fair hearing before coming to a conclusion, so that you may have before you the evidence that has convinced me, and you can then form your own opinions."

We can hardly describe fully the laws which Mr. Russell thinks that he has established, but broadly we should state them as follows:—(1) A recurrence of similar weather each 19 years; (2) If representing good seasons (which seems to mean wet ones) by the letter G, and bad ones (which are droughty ones) by B, there should be a normal sequence, but his own table does not show it.

Well, our opinion is that Mr. Russell has not proved his case. We shall be delighted to be convinced that we are wrong, because the discovery of any definite rule respecting coming seasons would be a priceless boon to the human race, and—compared with it—the discomfiture of the Editor of the *Meteorological Magazine* would not be of the slightest consequence. We cannot analyze and criticize 47 pages in two. The only thing to do is to indicate what we think has unconsciously led astray so able a man as Mr. Russell.

The first and great mistake seems to be that the author has not laid down a definition of what constitutes a good or a bad season. On page 3 he mentions "a period of months or years during which little rain falls, and the country gets burnt up." Yes, but what is "little rain," how much "burning up" is involved. And on the very next page we read "Drought is not wholly made by a shortage of rainfall. Its most important factors are great heat and drying winds." Here again we have an absence of definition; what is the precise meaning of "great heat," and what is the humidity and velocity constituting a "drying wind." These questions may seem puerile, but we believe that without sharp definitions of this kind, no two persons going independently through a 30 years meteorological register would take out droughts beginning and ending at similar times; and if this is true where we have a perfect statistical record as our basis, how much stronger does it become when we have only old chroniclers upon which to rely.

Then the diagram is novel, it goes from 1788 to 1895, and every year is "classed as good or bad, that is, having sufficient or insufficient rainfall," and moreover—as the author tells us on the previous page—"*without regard to their* (*i.e.* the droughts) *intensity.*" This is quite new—a diagram with no such thing as an average year, though rather oddly no characters are assigned to 1855–56. We have tried to find out how the diagram has been constructed, and give the figures for the first ten years we tried:—

Years.....	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879
Total R at Sydney ...	64·2	52·3	37·1	73·4	63·6	46·2	45·7	59·7	49·8	63·2
	+	−	−	+	+	−	−	+	−	+
Character in Diagram..	G	G	B	G	G	B	B	B	G	G

Roughly, the years with large totals are marked Good, those with small ones Bad; but 1877 and 1878 seem reversed. But we are not yet sure that we are on the right track, because from the diagram and from the nature of things it seems that the droughts are reckoned independently of the civil year. And if so, would two students

start with the same month? Moreover, what becomes of the multiples of the odd months in relation to the 19 years period?

Then Mr. Russell works in records of red rain, gales, cyclones, and great frosts, but at present we are inclined to wait for the strong test of futurity. Sometimes we are puzzled to know at what the author is driving; for instance, on the last two pages we read of storms and famines in Cook's Island "About 1813," "In December, 1831," "In March, 1846," and "On March 27th, 1866." We do not see the 19 year cycle in these dates—1813–31 = 18; 1831–46 = 15; 1846–66 = 20; moreover, we find in the diagram 1813B, 1831G, 1846B, 1866B.

However, Mr. Russell is so able, and has done such good work for New South Wales, that we hope that it is only our obtuseness which prevents our being convinced. Probably the curve of the dividends of the Colonial Banks will afford a fair commentary on the predictions which are, Good for 1897–8, 1901–2, and 1906; and Bad for 1899–1900, and 1903 to 1905.

Buletinul Observatiunilor Meteorologice din Romania de STEFAN C. HEPITES, Directorul. Anul V., 1896. Bucuresci, 4to., 1897.

WE are glad to see that Director Hepites is advancing rapidily with the organization of the meteorological service for Roumania, and that, as regards promptitude of publication, he is showing the Directors of Western Europe an example. This pamphlet contains chiefly the monthly summaries of the 34 climatological and 309 rainfall stations which he has established, but in the first place he must be congratulated on their number, and secondly upon the promptitude which has enabled him to give us the complete totals for the year—within three months of its closing. We hope that at an early date Dr. Hepites will give a map showing the position of all his stations. Meanwhile we may just mention that the rainfall during 1896 over Roumania seems to have been generally about 16 inches and the following appear to have had the greatest and least rainfall:—

				RAIN in 1896.			Days with .04 or more
	Lat.	Lon.	Altitude.	Total. in.	M. in 24 hrs. Depth. in.	Date.	
Domnesci, Muscel	45° 9′ N.	24° 53′ E.	1640ft.	53·78	2·96	10 vi.	84
Mangalia, Constanta...	43° 37′ N.	28° 37′ E.	105ft.	6·46	1·09	16 xii.	28

Annales de l'Observatoire Météorologique du Mont Blanc (Altitude 4,358 mètres = 14,298 ft.) Publiées sous la Direction de J. VALLOT, Fondateur et Directeur de l'Observatoire. Tome II avec 7 Planches et 19 Figures. 4to. Steinheil, Paris. 1896.

ON a previous occasion, *Met. Mag.*, Vol. XXX (1895), pp. 9-10, we had great pleasure in calling attention to the splendid work being done by M. Vallot at great cost of money, of time, and of strength in the building, equipping and maintaining this loftiest of European

meteorological stations. We are glad to welcome the second of his valuable volumes of *Annales*, and we congratulate M. Vallot on the very fair, and yet appreciative, report upon his work made by the reporters of the *Académie des Sciences* (as they were MM. Mascart, Bouquet de la Grye and Daubrée it is not easy to see how the author could have more competent judges). The following is a free translation of the concluding sentence of their report:—

"This short note will sufficiently show that in pursuit of his object M. Vallot has had to conquer many difficulties, sufferings and dangers. He has carried out the whole without any government assistance and entirely at his own expense. This savant deserves all credit for his energy, his perseverance and his devotion to Science."

Reference to our previous review will show how thoroughly we agree with the above statement.

The present volume deals chiefly with barometric records, actinometric observations and the triangulations necessary for M. Vallot's survey of Mont Blanc on the scale of rather more than three inches to the mile. One paper of 24 quarto pages, devoted to difficulties of scientific observations at great altitudes, is extremely interesting. In fact it is a sort of epitome of the author's experiences, and as he tells us that he has made 22 ascents, and has on one occasion remained nine consecutive days at his lofty observatory, his experience is unique. We are sorry to infer from one expression that the severe strain produced by the climbing, the deficiency of oxygen, and the low temperature have somewhat impaired M. Vallot's health, it would have been wonderful if that were not the case, but he is as energetic as ever and promises a third volume at an early date. France may well be proud of such a worker.

Report and Results of Meteorological Observations made at Ardgillan, Co. Dublin during the year 1896, by CAPT. E. R. TAYLOR, F.R.Met.Soc. Privately printed, 4to., 1897. London. 23 pp., 1 plate. The same for 1892. 4to., 1897, 6pp.

CAPTAIN TAYLOR has in these two pamphlets given in a very clear and compact form the results of his station—so clear indeed that there is scarcely any room for criticism. If we had had a sea level pressure of 31·043 inches to record, we think that we should not have passed it over so lightly as the author has done on p. 14. It is never safe to prophecy, but judging by the past it will probably be 50 or 100 years before such a fact has to be recorded again. Then on page 3 he tells us that there are at Ardgillan two rain gauges, an 8-inch and a 5-inch, but we cannot find the result of the former, although from the pamphlet for 1892 it is evident that it, the 8-inch gauge, was the first erected.

Another welcome addition to the pamphlet for 1897 will be a view of the station showing the position of the instruments, or a scale plan of the ground such as used to be given by the Royal Meteorological Society.

The smaller pamphlet for 1892 is welcome, as it contains the results for the first year for which records exist.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	62·9	8, 9	29·2	28	53·6	40·5	41·5	84	100·6	24·8	3·05	18	6·2
Malta	84·1	2	56·6	27	76·5	62·7	63·2	81	134·8	50·3	2·50	4	6·5
Mauritius	82·6	13	63·0	9	79·5	67·3	62·9	73	138·2	54·0	·54	14	5·4
Calcutta	91·7	5	69·4	21	88·8	73·0	69·9	69	152·5	62·0	·00	0	1·0
Bombay	95·0	29	76·6	31	90·2	78·7	75·7	76	141·3	63·6	·01	1	1·1
Ceylon, Colombo	89·8	29	72·0	29	86·5	74·8	74·0	84	145·0	69·0	16·78	23	7·0
Melbourne	89·5	28	36·9	2	68·5	47·5	47·7	70	139·5	29·0	·78	7	5·7
Adelaide	97·8	28	40·0	7	77·3	52·5	46·2	54	155·8	28·5	·34	7	3·8
Sydney	92·4	13	47·6	3	73·4	58·4	56·1	71	149·9	39·2	2·19	10	4·7
Wellington	65·0	26	34·0	1	58·9	46·9	42·5	68	130·0	27·0	3·18	16	4·3
Auckland	67·5	31	40·0	10	62·2	48·9	45·8	71	137·0	35·0	1·93	20	5·0
Jamaica, Kingston	92·8	21	71·3	23	89·7	74·1	...	...	...	...	·97	5	...
Trinidad	88·8	...	72·1	...	...	...	74·3	81	...	...	6·05	...	...
Grenada	88·4	19	72·0	14*a*	85·0	75·4	71·0	75	158·0	...	4·14	14	3·0
Toronto	66·8	29	27·8	26	52·4	37·4	38·1	75	83·0	23·0	2·16	11	6·3
New Brunswick, Fredericton	66·7	1	25·4	11	52·0	35·9	37·7	80	...	...	5·15	13	7·2
Manitoba, Winnipeg	73·6	2	13·4	21	48·7	26·4	...	...	...	...	1·01	7	6·2
British Columbia, Esquimalt	65·5	15	35·2	27	56·1	42·5	46·0	92	...	...	2·87	12	6·2

a—and 26.

REMARKS.

MALTA.—Adopted mean temp. 69°·1, or 0°·4 below the average. Mean hourly velocity of wind 8·0 miles. Average temp. of sea 73°·5. Thunderstorms on 1st, 2nd, 3rd and 5th. Lightning on 5 days; hail on 3rd. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8 above, of dew point 1°·1 above, and rainfall 1·09 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 1·4 below average; extremes, 20°·2 on 4th and 29th, and 2·0 on 9th; prevailing direction, E.S.E. The driest October on record, with the exception of 1878. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days; lightning was seen on the 29th. F. W. GRIMLINTON.

Adelaide.—Mean temp. 2°·9 above the average of 39 years. Another very dry month, the total fall being 1·52 in. below the average for 39 years, and the least but one on record for this month. C. TODD, F.R.S.

Sydney.—Rainfall ·67 in. below, temperature 2°·4 above and humidity 1°·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, wind chiefly S.E.; the middle of the month generally fine. On night of 23rd severe thunder and rain storm from N.W., causing damage; 1·20 in. of rain falling between 7 and 8 p.m. The remainder of the month unsettled. Prevailing wind N.W., frequently strong. Hail on 2nd. Mean temp. 0°·7 below, and rainfall 1·19 in. below, their respective averages. R. B. GORE.

Auckland.—A cold and windy month, with an unusual predominance of S.W. winds. Mean temperature and rainfall considerably below the average. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 2·8 miles. Kingston rainfall one-eighth of the average. Island rainfall eleven per cent. below the average. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·41	XI.	Rhayader, Nantgwillt ...	7·92
II.	Dorking, Abinger Hall .	5·66	,,	Lake Vyrnwy	8·11
,,	Birchington, Thor	3·10	,,	Corwen, Rhug	...
,,	Hailsham	4·51	,,	Criceith, Talarvor..... ...	3·66
,,	Ryde, Thornbrough	5·20	,,	I. of Man, Douglas	4·81
,,	Emsworth, Redlands ...	4·16	XII.	Stoneykirk, Ardwell Ho.	4·86
,,	Alton, Ashdell	6·04	,,	New Galloway, Glenlee	8·57
III.	Oxford, Magdalen Col..	2·59	,,	Lilliesleaf, Riddell	3·72
,,	Banbury, Bloxham	4·04	XIII.	N. Esk Res. [Penicuick]	4·75
,,	Northampton, Sedgebrook	3·67	,,	Edinburgh, Blacket Pl..	2·87
,,	Duddington [Stamford].	2·91	XIV.	Glasgow, Queen's Park..	4·05
,,	Alconbury	1·84	XV.	Inverary, Newtown	7·96
,,	Wisbech, Bank House...	2·12	,,	Oban, The Corran	7·88
IV.	Southend	3·19	,,	Islay, Gruinart School ...	1·97
,,	Harlow, Sheering..... ...	3·74	XVI.	Dollar.....	5·47
,,	Colchester, Lexden	2·97	,,	Balquhidder, Stronvar...	11·12
,,	Rendlesham Hall	2·00	,,	Ballinluig	5·85
,,	Rushall Vicarage	2·66	,,	Dalnaspidal H.R.S.....	9·70
,,	Swaffham	2·76	XVII.	Keith H.R.S.....	4·13
V.	Salisbury, Alderbury ...	4·82	,,	Forres H.R.S.	1·41
,,	Bishop's Cannings	4·06	XVIII.	Fearn, Lower Pitkerrie..	1·97
,,	Blandford, Whatcombe .	5·51	,,	N. Uist, Loch Maddy ...	6·16
,,	Ashburton, Holne Vic...	7·08	,,	Invergarry.....	5·29
,,	Okehampton, Oaklands.	5·57	,,	Aviemore H.R.S.	2·12
,,	Hartland Abbey	4·89	,,	Loch Ness, Drumnadrochit	2·65
,,	Lynmouth, Glenthorne.	6·52	XIX.	Invershin	5·34
,,	Probus, Lamellyn	4·48	,,	Scourie	3·90
,,	Wellington, The Avenue	5·01	,,	Watten H.R.S.....	2·63
,,	Wincanton.....	4·17	XX.	Dunmanway, Coolkelure	11·29
VI.	Clifton, Pembroke Road	4·20	,,	Cork, Wellesley Terrace	5·57
,,	Ross, The Graig	3·81	,,	Killarney, Woodlawn ...	7·40
,,	Wem, Clive Vicarage ...	2·63	,,	Caher, Duneske	5·52
,,	Cheadle, The Heath Ho.	2·77	,,	Ballingarry, Hazelfort...	5·00
,,	Worcester, Diglis Lock	3·11	,,	Limerick, Kilcornan ...	4·49
,,	Coventry, Kingswood ..	3·09	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	2·49	,,	Miltown Malbay	6·45
,,	Horncastle, Bucknall ...	2·07	XXI.	Gorey, Courtown House	4·59
,,	Worksop, Hodsck Priory	2·44	,,	Athlone, Twyford	4·91
,,	Neston, Hinderton	2·01	,,	Mullingar, Belvedere ...	4·22
VIII.	Southport, Hesketh Park	2·84	,,	Longford, Currygrane...	3·76
,,	Broughton-in-Furness ...	7·64	XXII.	Woodlawn	5·34
IX.	Ripon, Mickley.....	4·66	,,	Crossmolina, Enniscoe ..	8·03
,,	Melmerby, Baldersby ...	3·01	,,	Collooney, Markree Obs.	6·60
,,	Scarborough, Observat'y	2·66	,,	Ballinamore, Lawderdale	6·39
,,	Middleton, Mickleton ...	5·66	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	5·53	,,	Warrenpoint.....	5·74
,,	Bamburgh	3·04	,,	Seaforde..	4·73
,,	Keswick, The Bank.....	8·02	,,	Belfast, Springfield	5·65
XI.	Llanfrechfa Grange	5·58	,,	Bushmills, Dundarave..	4·19
,,	Llandovery	6·89	,,	Stewartstown	4·15
,,	Castle Malgwyn	6·13	,,	Killybegs	9·70
,,	Builth, Abergwesyn Vic.	9·25	,,	Lough Swilly, Carrablagh	7·02

MARCH, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	3·42	+ 1·81	·49	2	17	61·7	23	26·8	30	3	1
II.		Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...	...	..	..
,,		Strathfieldsaye	4·65	...	·57	2	21	...	...	...	...	...	..
III.		Hitchin	4·13	+ 2·79	·65	2	19	61·0	21	26·0	29	6	..
,,		Winslow (Addington)	2·97	+ 1·25	·66	17	19	65·0	21	24·0	30	7	1
IV.		Bury St. Edmunds (Westley)	2·73	+ 1·18	·59	2	15	61·0	22	31·0	30	..	..
,,		Norwich (Brundall)	2·33	...	·46	2	17	62·0	21	27·8	13	5	1
V.		Weymouth(LangtonHerring)	4·51	+ 2·61	·76	2	21	57·0	31	33·0	30	0	..
,,		Torquay (Cary Green)	5·89	...	1·52	2	18	58·6	19*b*	35·0	5, 30	0	
,,		Polapit Tamar [Launceston]..	3·89	+ 1·36	·59	2	22	58·1	27	29·9	30	2	
VI.		Stroud (Upfield)	3·60	+ 1·41	·77	2	20	67·0	26	31·0	7, 29	2	..
,,		ChurchStretton(Woolstaston)	3·76	+ 1·63	·51	17	24	57·0	22*c*	29·0	30	9	2
,,		Tenbury (Orleton)	3·44	+ 1·36	·72	2	21	63·8	21	24·0	30	5	1
VII.		Leicester (Barkby)	2·10	+ ·39	·46	14	21	64·0	21	22·0	29	10	1
,,		Boston	1·82	+ ·28	·36	14	17	60·0	21	28·0	13	6	..
,,		Hesley Hall [Tickhill].....	2·47	+ ·57	·50	2	20	61·0	21	25·0	30	6	..
VIII.		Manchester(PlymouthGrove)	2·61	+ ·39	·40	3	20	62·0	22	27·0	30	3	
IX.		Wetherby (Ribston Hall) ..	...	...	...	...	...	...	...	...	...	...	..
,,		Skipton (Arncliffe)	9·89	+ 4·79	1·42	4	24	..	...	...	...	...	..
,,		Hull (Pearson Park).	2·93	+ ·88	·40	2	18	59·0	21	21·0	30	9	1
X.		Newcastle (Town Moor)	2·96	+ ·33	·38	14	19	...	..	...	...	...	..
,,		Borrowdale (Seathwaite).....	19·99	+ 9·49	1·91	2	28	...	...	...	...	...	..
XI.	WALES.	Cardiff (Ely).....	4·39	+ 1·41	·66	2	24	...	...	...	...	...	..
,,		Haverfordwest	5·75	+ 2·51	1·02	2	26	55·1	25	28·1	30	2	
,,		Aberystwith (Gogerddan) ...	5·46	+ 2·48	1·46	2	21	61·0	23	...	..	...	..
,,		Llandudno.....	2·92	+ ·84	·46	12	19	62·0	22	34·5	8	0	..
XII.	SCOTLAND.	Cargen [Dumfries]	5·91	+ 2·61	·86	2	22	56·0	23	23·4	30	6	..
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	..
XIV.		Colmonell	6·32	...	·62	3	24	59·0	21	21·0	31	...	..
XV.		Lochgilphead (Kilmory)	6·11	+ 1·65	·70	22	27	...	...	21·0	30	10	..
,,		Mull (Quinish).....	7·55	+ 3·71	·96	22	22	...	...	...	...	...	..
XVI.		Loch Leven Sluices	5·50	+ 2·53	1·00	23	20	...	...	...	...	...	..
,,		Dundee (Eastern Necropolis)	3·60	+ 1·20	·65	15	25	58·0	24	25·7	30	8	..
XVII.		Braemar	5·92	+ 3·28	·94	13*a*	26	51·8	24	18·6	3	14	2
,,		Aberdeen (Cranford)	3·91	...	·60	13	26	58·0	24*c*	24·0	28	8	
,,		Cawdor (Budgate)	1·89	— ·15	·29	22	25	...	...	...	...	...	..
XVIII		Strathconan [Beauly]	6·18	+ 1·86	·68	17	15	...	...	...	...	..	..
,,		Glencarron Lodge.....	7·40	...	1·00	18	30	52·1	22	20·6	31	13	..
XIX.		Dunrobin	3·68	+ 1·43	·53	22	25	54·0	24	26·0	30	6	..
,,		S. Ronaldsay (Roeberry).....	4·01	+ 1·47	·55	26	28	50·0	21	26·0	29*e*	12	..
XX.	IRELAND.	Darrynane Abbey.....	6·40	...	·77	27	26	...	...	...	...	...	..
,,		Waterford (Brook Lodge) ...	5·91	+ 3·01	1·12	11	23	58·5	24	29·0	30	3	..
,,		O'Briensbridge (Ross)	4·80	...	·94	11	20	...	...	...	...	...	..
XXI.		Carlow (Browne's Hill)	4·75	+ 2·38	·98	2	22	...	..	...	...	...	..
,,		Dublin (FitzWilliam Square)	2·98	+ ·97	·74	11	24	61·6	21	29·0	30	1	
XXII.		Ballinasloe	4·75	+ 2·12	·79	11	28	58·0	22	30·0	30	7	..
,,		Clifden (Kylemore)	10·68	...	1·09	2	26	...	...	...	...	.	..
XXIII		Waringstown	5·38	+ 3·03	·78	27	26	59·0	24*d*	21·0	29	11	1
,,		Londonderry (Creggan Res.).	5·05	+ 2·32	·99	4	27	...	...	...	...	...	..
,,		Omagh (Edenfel)	5·44	+ 2·93	·70	11	26	56·0	21	24·0	29	7	1

+Shows that the fall was above the average ; —that it was below it.

a—and 15. *b*—and 24. *c*—and 26. *d*—and 25. *e*—and 30.

METEOROLOGICAL NOTES ON MARCH, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

HITCHIN.—The wettest March in our record, which began in 1850, excepting 1864, when 4·14 in. of R fell.

ADDINGTON.—A month of very unsettled weather, with frequent very high winds. Thunder was heard on the 10th, 15th and 17th; on the 15th there was a rainbow at 7 a.m., and again at 4 p.m.; on the 17th there was much L at night. The morning of the 30th was very cold, the shade temp. falling to 24°. Brook overflowing on 3rd. Only twice during 27 years has the rainfall been exceeded in March—to wit, 1876, 3·60 in., and 1888, 2·99 in.

BURY ST. EDMUNDS, WESTLEY.—A mild month, with high winds. Vegetation very forward. TS, with H, on 4th; S and R on 31st.

NORWICH, BRUNDALL.—A windy, but mild month. Mean temp. 44°·9, constituting the fifth March in succession with temp. higher than the average. Between the 17th and 28th the thermometer did not once fall to 40°, and on two nights the min. was as high as 47°. R of month ·61 in. above average. T on 4th and 18th. Squally, with H, on 1st; gales on 3rd and 19th.

WEYMOUTH, LANGTON HERRING.—The previous heaviest rainfall in March in 23 years was in 1891, 3·58 in., which is ·93 in. less than that of the present month. For the first three months of this year the rainfall is 4·05 in. in excess of the average, and is ·56 in. more than in the next highest. The average temp. at 9 a.m., 44°·4, is 2°·7 above the average of 26 years. Between 8 and 9 a.m. on the 3rd occurred the most destructive storm remembered here; trees were uprooted in all directions, and slates and tiles blown off in great numbers. A severe TS occurred on the evening of the 17th. Solar halos were seen on the 2nd, 9th and 27th; and lunar halos on the 12th and 13th. Constant fogs from 20th to 25th.

TORQUAY, CARY GREEN.—Rainfall 3·47 in. above the average. Mean temp. 46°·7, or 2°·8 above the average. Duration of sunshine 136 hours 50 minutes, being 8 hours 30 minutes below the average. No absolutely sunless day.

POLAPIT TAMAR [LAUNCESTON].—A wet month. The first half of the month was cold and stormy. The average shade temp. rather less than that of February. T, L and H on 4th; T and H on 16th; and T on 17th. S.W. gale on 2nd.

STROUD, UPFIELD.—S.W. gale on night of 2nd, and N.W. gale all day on 3rd, with S and sleet; and S.W. gale on 4th. T and H on 10th. S.W. gale on 11th. Sharp TS at 7.30 p.m. on 17th. S.W. gales on 26th and 28th. S on the hills on 31st.

WOOLSTASTON.—A cold, wet, and stormy month. Heavy gales, with S storms, on 2nd, 3rd, and 11th. S on the 30th and 31st. Mean temp. 42°·8.

TENBURY, ORLETON.—A warm, wet month; in fact, the wettest March since 1867. All vegetation very forward, but severe frost on the 30th checked it considerably. T and L on the evening of the 17th.

LEICESTER, BARKBY.—A month of great barometrical fluctuations and very high winds, even for March; almost all "Lion" and no "Lamb." Mean temp. 44°·4. Thunder on 10th and 17th. S on 31st.

ARNCLIFFE VICARAGE.—Very wet, with much wind, and less S than usual.

HULL, PEARSON PARK.—TS on 4th; squally, with H, on 16th. T on 18th. Squally, with H showers, on 26th.

WALES.

HAVERFORDWEST.—I cannot find a record of a wetter March than this since the commencement of observations in 1849. It commenced with very stormy

weather and low temp. A gale of great energy, after a day of storm and heavy rain, sprang up at 0.30 a.m. on the 3rd, accompanied by H and S showers; some squalls being of exceptional violence, especially one at 6.30 a.m., and several large trees were uprooted. Prevailing winds were from S., S.W., W., and N.W. The month ended as it began, stormy. Vegetation very forward.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month. Snowstorms on the 2nd and 3rd, with strong wind from S.W.

SCOTLAND.

CARGEN [DUMFRIES].—Absence of sunshine, Easterly winds, and almost incessant rainfall combined to make the month the most unpleasant on record. Barometrical pressure only on one day (7th) exceeded 30 inches, and, with the exception of the mean reading in 1862, is the lowest recorded in March at this station. The temp. has been 1° above the average, but never have there been more wet days, while the total rainfall has only once (in 1868, when the exceptional figure 8·14 in. was registered) been exceeded. S fell almost continuously during the afternoon and night of 30th. A severe gale blew from S. on 22nd. The number of hours of sunshine recorded has only once been smaller. Farm work was very much retarded.

COLMONELL.—Rainfall 2·99 in. above, and mean temp. 2°·1 above the average of 20 years. H shower on 1st; soft S on 3rd; S, sleet, and H on 4th.

BRAEMAR.—The old saying in March, "In like a Lion and out like a Lamb," was falsified this year. It may be said here, In like an angry Lion, and out like a fierce Lion. Roaring winds, with snow and drift.

ABERDEEN, CRANFORD.—The month was very cold, with high winds.

S. RONALDSAY, ROEBERRY.—A very cold, wet month. Mean temp. of the month, 38°·8.

IRELAND.

DARRYNANE ABBEY.—The first half very wild and cold; the second half mild but stormy. The wettest March registered. H showers on 2nd, 3rd and 4th.

WATERFORD, BROOK LODGE.—A very wild and wet month. The wettest March for about 50 years. H on 1st, 4th, 10th and 15th. S showers on 3rd, 10th and 12th. L on 4th, 5th and 17th. Thick fog on 19th, 20th, 21st, 22nd, 23rd and 25th. Gale from S.W. on 26th. Water in screen frozen on 29th.

O'BRIENSBRIDGE, ROSS.—This was the third bad March in succession, and the worst of the three.

DUBLIN.—Like March, 1896, this was a changeable, wild, and rainy month. During the first half temp. was low. A warm spell followed, but temp. again fell briskly on the 28th, and the month closed cold and ungenial. Compared with February, the mean temp. showed a falling off of one degree. Notwithstanding, the progress of vegetation was very rapid, and on the last day the trees presented quite a vernal appearance. Mean temp., 45°·2, 2°·1 above the average. Foggy on two days. High winds were noted on 20 days, reaching the force of a gale on 9. S or sleet occurred on 6 days, and H on 7 days. Solar halos on 5 days. Lunar halos on 3 days. T on the 17th. L on the 1st and 3rd.

WARINGSTOWN.—Unusually wet. Spring rather early, but labour backward.

OMAGH, EDENFEL.—A month of almost continuous gales and rain, the total fall exceeding by ·97 in. the next wettest March (1868) since the records commenced in 1865. As a result the saturation of the soil prevented spring sowings of all kinds, and farm labour is backward almost beyond precedent. Temp., however, was sufficiently high to promote considerable vegetation, especially in trees, until checked by the sharp frosts of the last week.

NOTICES.

It is requested that all Books for Review, and Communications the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in letters published in this Magazine rests with their respective authors.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Ro Meteorological Societies, and of the British Astronomical Association; Artic by various eminent Astronomers, English, American, and Continent Correspondence on topics of interest connected with the Science; Notices Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assistan and direction of observers.

The Observatory was founded in 1877, and has become an established and very valua publication.—*Prof. Young*, in "*Ten Years' progress in Astronomy.*"

All communications should be addressed to the Editors of "The Observatory" Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s

NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVI.] MAY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

Louis Pascal Casella.

1809—1897.

IT is but a few years since Mr. Casella retired, and few of those who saw him during the closing years of his business life would have thought that he was then well beyond the "fourscore years."

It is only since his death that we have heard that his second name was not Philip, but Pascal, and that it was supposed to be a family name. There seems little chance of now verifying the tradition, but it is a curious coincidence that the deceased, whose name will not soon be forgotton by meteorologists, should have borne also the honoured name of Pascal. Moreover, it is strange that Mr. Casella's Italian parent should have given his son the French name. Although Mr. Casella's father was by birth and parentage an Italian, he had resided in Edinburgh during the latter part of the 18th century, and he and his son removed to London only about 1835. Shortly afterwards the son joined the late Mr. Tagliabue as an instrument maker; he married his daughter, and half a century ago succeeded to the business, which at that time was extensive rather than scientific. Long before that time Mr. Casella had become a member of the original Meteorological Society, and, whether as a cause or as a consequence we know not, but, as a fact, Mr. Casella has chiefly been known as a maker of high-class instruments for meteorologists and travellers. As the business is being continued by one of the sons we think it best to leave the father's work to stand upon its own merits; but there was one feature in Mr. Casella's character which, now that he has passed beyond human praise, ought to be mentioned: his kindliness of disposition was well-known, but far more noteworthy was his benevolence to those who were in need.

HAILSTORM IN SOUTH LONDON.

To the Editor of the Meteorological Magazine.

SIR,—The storm of the 27th ult. having apparently been peculiar to this locality, I venture to think that some notes upon it may be of interest to you. Commencing at 6.30 p.m., the hail fell so thickly that the ground was soon covered to a considerable depth, bearing a resemblance to a heavy snowfall. A great deal of damage accrued to fruit trees, the partly "set" fruit of the pear and plum being cut off completely, and early rose-trees stripped of leaves and buds. The hail was followed by heavy rain, which, being unable to escape down the gutters and drains through the mass of hailstones which choked them, flooded the houses. doing not a little damage. The hailstones were of a large size and divers shapes, one which I picked up measuring half-an-inch square, but being soft, they did little damage to glass. The storm lasted one hour, and on measuring the rain at its conclusion the amount in the gauge was found to be 1·18 inches. I am informed by an "old inhabitant" that it is necessary to go back to August, 1846, for a parallel hailstorm in this neighbourhood. You will probably receive many letters on the subject, and it will be interesting to note how far the storm extended; as, from what I can gather, the area affected by it was very small, and the rainfall very variable even within that limit.

I am, Sir, yours faithfully, D. W. HORNER.

Clapham Park, S.W., May 1st, 1897.

[Our correspondent is correct in referring to the great storm of August 1st, 1846; but that was far more serious than the one in 1897, giving the tremendous rainfall of 3·12 inches in 2 hours 17 mins. We do not think that any rain gauge recorded the full intensity of the recent storm; Mr. Horner's 1·18 in. is the highest, and that is by no means remarkable for a thunderstorm with hail—and at most stations in the neighbourhood, *i.e.*, in North Surrey, the fall was quite insignificant. The only returns of even half-an-inch which we have received are—

	in.		in.
Kingston	·60	Surbiton (Seething Wells)	·73
Brixton (Acre Lane)	·62	New Malden (Sewage Works)	1·02
Wimbledon (Sewage Works)	·68	Clapham Park (New Park Road).	1·18

and yet we know from the pierced leaves which Mr. Horner has sent us that the hail was serious, and from eye-witnesses that the following accounts are substantially correct]:—

HEAVY THUNDERSTORM IN SOUTH LONDON.

"A correspondent writes:—For many years I have lived in South London, but never have I experienced anything like the scene which was witnessed at the base of Brixton Hill during the prevalence of last night's thunderstorm. Taking it altogether, with rain and hail, there was not probably more than twenty or five-and-twenty minutes' downpour, but that sufficed to temporarily

transform the appearance of the locality. The hill itself is a steep declivity—neither so high nor so steep, it is true, as that of Highgate—but a steady, persevering rise, starting at, say, the White Horse in the Brixton Road, and terminating a mile or a mile-and-a-half further south at Streatham Place. It is a broad thoroughfare, flanked by open gardens and shaded in many places by trees of respectable size and antiquity. The pavements are high-pitched, and the gutters are, consequently, relatively speaking, deep. Under the centre of the roadway itself run the two continuous tunnels through which the miles of tram cables run that draw cars and bogies from Kennington to Streatham. After the first few peals of thunder the hail began to pour down as though through some vast overhead sieve, and in a few minutes gutters were choked and lawns were covered for a depth of an inch or more. This was succeeded by rain of a semi-tropical character, and was followed a little later by a second storm of blinding hail. The hill was speedily converted into something like a cataract, the water running between the high kerb stones inches deep. Horses driven from the side streets refused to face it, and more than one driver had to get down and lead his frightened charge. It will scarcely be credited, but I actually saw a plank of timber merrily floating down the roadway. The southern tram traffic was first impeded, and then temporarily suspended, the bogies with their broad noses making heavy way 'up stream,' and throwing up water on each side as though they were snow ploughs driving through a drift. One lady I saw cross the main road, just at the base of the hill, had the water above her boot ankles, and I myself had to wade through inches of water to make my way to a belated tramcar which managed to make slow progress through the miniature sea because it was going citywards."—*Daily News.*

"Another correspondent writes:—A very curious experience happened to me yesterday. I had been spending the morning at a South Coast watering-place. It was to all appearance a perfect summer day—warm and balmy, with just wind enough to temper the sun. I left about half-past five, and as I entered the train, I noticed that the carriage was flooded with the sunshine, and it was necessary to draw down the blinds on one side. Then I lit a cigar, plunged into the *St. James's Gazette*, and for an hour or so forgot all about the weather. Suddenly, some time after we had passed Croydon, I looked out of the window, and almost shouted in my astonishment. An amazing spectacle greeted me. I had passed from summer to winter. The fields, the roofs, the roads, the railway-track, were all white with what seemed snow. I learnt afterwards that it was only hail, but to all appearance it was snow lying thickly on the ground, and the whole landscape was quite winterly."

St. James's Gazette.

ON THE WORSHIP OF METEORITES.

By the late Professor Newton.

The January number of the *American Journal of Science* opens with an article written some years since by Professor Newton, but not previously published.

"In it the author has brought together a large number of facts showing the superstitious regard attached to meteorites from the

very earliest times. The first case mentioned is that of the iron from an altar of an Indian mound in Ohio, which was preserved with other articles evidently regarded as of peculiar value. By some this iron is regarded as probably the same as that of which a number of masses were found about 1886 in Kiowa county, Kansas. Another case spoken of is that of the stone which fell at Ensisheim, in Alsace, 1492, which was preserved in a church at that place. A fall of stones some nineteen years later near Milan, in Italy, is also alluded to as having probably been the occurrence recorded by Raphael by the fireball in his picture of the Foligno Madonna now in the Vatican. The sacred stone of the Mohammedans preserved in the Kaaba of the mosque at Mecca is also mentioned as perhaps a case in which a meteorite has been selected for long continued worship. The author then goes on to discuss a number of instances recorded in classical literature, and, although it is impossible to say that in each case a meteorite was the object described, in many cases it seemed highly probable. The Palladium of Troy, the needle of Cybele, the original image of the Ephesian Artemis, are some of the cases which the author describes in detail with quotations from the original authorities.

"On a later page of the same number a description is given by Warren M. Foote, of a new meteoric iron from the Sacramento Mountains, in New Mexico. This is a typical siderite and weighed, as found, 237 kilograms (521 pounds). It shows the common octahedral structure with unusual distinctness. Two plates accompany the article, one showing the appearance of the iron itself, one-eighth the natural size, the other the Widmannstätten figures printed directly from an etched slab. As further bearing on the same subject is to be mentioned a catalogue of the meteorites in the Yale University collection, which forms an appendix to the number."—

Science.

THE FORMATION OF DEW.

By Dr. J. G. McPherson, F.R.S.E., Lecturer on Meteorology in the University of St. Andrews.

UNTIL very recently the exact constitution of the nature and formation of dew was unknown even to scientific men. The opinion was generally held that if you went through the glistening meadow on a summer evening, through the diamond drops sparkling in millions, you would get your trousers or your boots moistened with dew. It was also believed that dew fell from the air upon the ground. Now in both cases the opinion was wrong, for it was not dew at all which was encountered in the meadow, and dew does not fall from the air. If you look into the garden on a dewy night—for there is such a thing as dew for all that—you will find some plants moist. Glistening drops appear on the Brocoli, but the Peas are dry. Place a hand-lantern below one of the healthiest Brocoli leaves, and you will find that the moisture is collected in clear drops along the edge of the leaf and at the end of the veins of the leaf. The leaf

veins radiating from the centre line of the surface have carried the moisture of the healthy plant to the edges to keep up plant circulation; and the drops you see are not dew drops, but the watery juices carried out by the energy of the healthy plant. For place the lantern under an unhealthy leaf, and you will find no drops; there is no circulating vitality in it. Again, examine grass blades, and you will find large drops near the tips of the blades, the rest of the blades being quite dry. The large drops seen on plants at night are falsely called dew; they are produced from the plants themselves as tokens of their active and healthy growth.

This can be demonstrated in more than one way. Remove a branch of Poppy and connect it by means of an indiarubber tube with a head of water of about 40 inches. After placing a glass receiver over it to prevent evaporation, leave it for three hours. Then you will find that water has been freely excreted through the veins, resembling what were familiarly called "dew drops." If the water pressed into the leaf is coloured with aniline blue, the drops when they first appear are colourless, but before they grow to any size the blue appears, showing that little water was held in the veins. What, then, has been for centuries called dew is not dew at all, but the watery juices of the healthy plants.

But look over dead leaves on a dewy night, and you will see a fine pearly lustre—that is dew. Dead matter gets equally wet when equally exposed, and real dew is not so common as is generally supposed. On many nights on which grass gets wet no true dew is deposited on it, and on all nights, when growth is healthy, the exuded drops always appear before the true dew. The difference between the true and the false dew can easily be detected. The moisture exuded from the leaf veins of the grass—false dew—is always isolated at points situated near the tips of the blades, forming drops of some size; whereas true dew collects evenly all over the blades. A glance distinguishes the pearly lustre of the dewy film from the glistening diamond drops of the healthy plant's juices.

But whence comes the dew? It does not fall from the air. Whence comes it, then? We shall see. Ground a little below the surface is always warmer than the air over it. As long, then, as the surface of the ground is above the dew point, vapour must rise and pass from the land into the air. The moist air so formed will mingle with the air above it, and its moisture will be condensed, forming dew wherever it comes into contact with a surface cooled below the dew point. In fact, dew rises from the ground.

Place some metal trays over the grass, the soil, and the road on dewy nights. You will generally find more moisture on the grass inside the trays than outside; you will always observe a deposit of dew inside the trays, even when there is none outside at all. This shows that far more vapour rises out of the ground during the night than condenses as dew on the grass and other objects.

Pieces of iron lying on grass are soon surrounded with richer grass, on account of the moisture which the cold metal attracts from the rising water-vapour. Travellers in Australia and South Africa state that they often found the under side of their waterproof bedding placed on the ground to be wet after camping out at night. That shows that even in dry countries vapour rises from the ground at night, I remember, when walking in the vicinity of Hexham with an acute observer, trained to farming, that, on my remarking that the farmers might to their profit remove the extraordinary quantity of

small stones from the fields in order to give room for the growth of the grain, he shrewdly said, "These stones collect moisture from the ground; the soil is thin, with a gravelly subsoil, and unless the maximum amount of moisture be collected (which can only be done by allowing these stones to remain), there would be a very deficient crop. They must not therefore be removed."

Dew, then, rises from the ground. But how is the dew formed on bodies high up in the air? If the dew comes out of the ground, should it not be found on bodies only exposed to the earth? Now, dew does not rise in particles, as it was once considered to fall in particles like fine rain. It rises in vapour. Some is caught by what is on the surface of the earth, but the rest ascends in vapour form until it comes in contact with a much colder surface, to condense it into moisture. The vapour does not flow upwards in a uniform stream, but is mixed in the air by eddies and wind currents, and carried to bodies far from where it rose. In fact, dew may be deposited, even though the country for many miles all round be dry and incapable of yeilding any vapour. In such cases the supply of vapour to form that dew would depend on the evaporation of the dew, and on what was wafted over by the winds.

But the most practically convincing proof of the rising of dew from the ground is in the form of hoar frost or frozen dew. If it has been a bright, clear, sunny day in January, with no snow on the ground, look over the garden, grass, and walks on the morning after the intense cold of the night; big leaves may be found scattered over the place. You see little or no hoar frost on the upper surface of the leaves, but turn up the surface next the earth, or the road, or the grass, and what will you see? You have only to handle the leaf in this way to be highly astonished. A thick, white coating of hoar frost, as thick as a layer of snow, is on the under surface. Leaf after leaf will present the same appearance. If a number of leaves have been overlapping each other, then there will be no coating of hoar frost under the top leaves; but when you reach the lowest layer, next the bare ground, you will find the hoar frost on the under surface of the leaves. Now, that is positive proof that the hoar frost has not fallen from the air, but has risen from the earth. And hoar frost is, as we have said, frozen dew.

Dew, then, mostly rises from the ground, and what used to be thought dew is the active exudation of the healthy grass. These two facts are now established. Brilliant globules are produced by the vital action of the plant, showing life in one of the most charming forms in the phenomena of Nature. —*Wakefield Express.*

REVIEWS.

The Atmosphere in relation to Human Life and Health. By FRANCIS ALBERT ROLLO RUSSELL, V.P. Royal Meteorological Soc., Fellow San. Inst., &c. Smithsonian Institution, Washington, 1896. 8vo, pp. 148.

WHEN a paper has received Honourable Mention and a Silver Medal from the Hodgkins Fund, and has been accepted and printed by the Smithsonian Institution, an ordinary reviewer feels it rather presumptuous to add his little meed of praise, and decidedly dangerous even to hint that the author has not always said what the reviewer would have expected him to say.

The first noteworthy features of this work are the large and extremely varied amount of information compressed into it, and the hopelessness of recovering any lost statement owing to there being neither index, nor table of contents, nor even specific headline on the pages. This might easily have been avoided, because the Memoir itself was written somewhat methodically in Parts and Sections. The Parts are—

I.—Constitution and Conditions of the Air ... page 2
II.—Climate Air and Health ... ... „ 51
III.—Various Atmospheric Conditions and Phenomena ... ... „ 87
IV.—Subjects for Research ... ... „ 117

Perhaps these do not sound very definite, but the Sectional headings, of which there must be more than a hundred, are so. We will give a few, just as we turn over the leaves :—Ozone, Vapour of water, Living germs in the air, Organic emanations from the skin, Influenza, Mode of attack of Miasmatic diseases, Mechanical ventilation in schools, The zodiacal light, Malaria.

There is a mass of information in the paper, of which it is not easy to convey an idea; perhaps the simplest plan is to reproduce two paragraphs :—

TYPHOID FEVER.

"Typhoid, or enteric, fever is most common in the autumn, and much less prevalent in May and June. There is a sharp decline in its prevalence in London in December. In New York, and in large towns in Europe, the maximum is decidedly apparent in late summer or autumn. The variation of prevalence according to season seems to show a distinct connection between the development of the bacillus and the temperature of soil and water; and, considering the long incubation and duration of cases, the maximum of infection must take place at the very time when the temperature of the soil, at 1 ft. or 2 ft. deep, is about at its highest."

HEIGHT OF THE ATMOSPHERE.

"Meteors which have been calculated to pass with ignition through air at a height sometimes as great as 300 miles; auroræ, of which the height has been estimated by careful observation sometimes to exceed 281 miles; and the duration of twilight, with polarizing effects of the sky, giving a height of 198 to 212 miles, agree in showing a much greater altitude for the extension of our atmosphere than was formerly supposed. First 5, and then 45, miles was generally stated as the outside limit. And we have to remember that at this great altitude of about 300 miles, the atmosphere is dense enough to produce very palpable effects. It would be a bold proposition to assign a limit to the atmosphere within 1,000 miles."

On the last pages of the Memoir, Mr. Rollo Russell develops, apparently in all seriousness, the most extraordinary meteorological proposal of which we ever heard—namely, the modification of climate

by the erection of monster walls as wind barriers! That we may not be suspected of misrepresenting his views, we conclude by reprinting two sentences from page 147.

"Portsdown Hill, which runs east and west for nearly seven miles, and is over 400 ft. high, would be another highly favourable ridge for an experimental wall, say 400 ft. in height. The practicability of works of this kind can hardly be questioned when we hear of structures like the reservoir embankment at Bombay, a stone barrier 118 ft. thick, over 100 ft. high, and two miles long. A less amount of material would have gone toward a wind wall 30 ft. thick at the base, 300 ft. high, and three or four miles long.

"A wall 300 ft. or 400 ft. in height, and five or six miles in length, extending from near the Thames a few miles east of London, in a north-westerly direction, would probably have the effect of stopping a considerable amount of fog, which often moves from the Essex marshes toward the metropolis. It would somewhat increase the rainfall on its westerly side. A wall stretching from N.W. to S.E. across some of the heaths in the neighbourhood of Woking would reduce the rainfall of North-east Surrey and of London."

The Roman wall, and even the great wall of China, though of far greater length than any suggested by Mr. Rollo Russell, are trifles compared with the walls 300 ft. or 400 ft. high which the writer suggests. What landowners, and Parliament, would say to such proposals, has to be ascertained; and it might have facilitated discussion had the cost per mile, of a wall 400 ft. high and strong enough to resist any gale, been procured from some competent engineer There is another object which these gigantic walls might serve, they might assist the proposed communications with the inhabitants of Mars.

Effects of the Weather upon Vegetation. A Lecture given by JOHN CLAYTON to the Bradford Naturalists' Society, March 1st, 1897. Byles & Sons, Bradford, 1897. 8vo., with a photograph.

THIS is one of the most instructive and original lectures that we have seen for a long time. Mr. Clayton is evidently a keen, painstaking, and very original investigator; and instead of the lecture being a series of platitudes and quotations, as is generally the case, it is almost wholly the result of investigations carried out with great care and patience during many years. As is it published at a nominal price, we merely specify a few of the points treated—such as, the relation of tree girth to amount of foliage, relative growth of plants in sun and in shade, followed by considerations as to the sunshine recorded in different parts of England and its influence on crops, percolation gauges, why trees split in times of frost, and the relation between the elongation of twigs and their increase in girth. When a well-printed pamphlet gives information, almost wholly original, on all these points for sixpence,—we need not advise our botanical and agricultural readers what course to pursue.

Observations made at the Blue Hill Meteorological Observatory, Massachusetts, U.S.A., under the direction of A. LAWRENCE ROTCH, A.M. *Discussion of the Cloud Observations*, by H. HELM CLAYTON. [Excerpt Annals of the Astron. Obs. of Harvard College.] Cambridge, U.S.A., 1896. 4to, 228 pp. and 18 plates.

THIS work is much more important and interesting than its title suggests, for it is not merely a Discussion of the Blue Hill Cloud Observations. Chapter I., entitled "Historical Sketch of Cloud Nomenclature," is really much more than a "sketch"; it occupies more than 50 4to pages, and gives the best history of the subject that we remember. It may be convenient to enumerate in chronological order the authorities quoted by Mr. Clayton:—

1801	Lamarck
1803	Howard
1804	Lamarck
1815	Forster
1828	Clos
1831	Kaemtz
1841	Loomis
1846	Fritsch
1857	Jevons
1860	Schmid
1861	Herschel
1863	Fitzroy
,,	Poëy
1865	,,
1868	Loomis
1870	Poëy
1874	Muhry
1875	Blasius
1879	Ley
,,	Poëy
1880	Ley
,,	Hildebrandsson
1881	Möller
,,	Weilbach
1882	Vettin
,,	Klein
1883	Koppen
,,	Russell, Rollo
,,	Ley
,,	Mohn
1884	Tissandier
1885	Scott
,,	Sprung
1885	Ley, Hildebrandsson, Capello
,,	Barker, Wilson
,,	Möller
1886	Jesse
,,	Toynbee
1887	Abercromby
,,	Clayton
,,	Hildebrandsson, Abercromby
1888	Abercromby
1889	Maze
,,	von Helmholtz
,,	Clayton
1890	Hildebrandsson, Köppen, Neumayer
,,	van Bebber
1891	Abbe, C.
,,	Singer
,,	Vincent
1892	Kassner
,,	Möller
1893	Gaster
,,	Hildebrandsson
,,	von Bezold
1894	Ley
,,	Davis, W. M.
,,	Hildebrandsson, Riggenbach, Teisserenc de Bort

Although the above list is not—does not profess to be—complete, it sufficiently indicates the thought and care devoted to the preparation of the "sketch"—a sketch of great ability and usefulness. We are not prepared to controvert any of the writer's statements, but at the same time we regret that he has been led to prepare, for use at Blue Hill, so complex a nomenclature (29 varieties) as that given on p. 342.

It is impossible for us to deal exhaustively with this work. Cloud observations as to amount, form, motion and altitude, have long been a feature in Blue Hill work; and in this paper we have a masterly discussion of them in relation to cyclones and anticyclones, to wind motion, to rainfall, to temperature, and to weather forecasting. We have long had doubts respecting the ideal forms of cyclones, and the following paragraph from p. 449 supports our doubts.

"Another point of interest shown by the preceding results is, that a cyclone cannot be looked upon as an eddy in the atmos-

phere like an eddy in a river, because the highest air currents have a resultant velocity of drift thirty times as fast as the lowest current, and the eddy would be rapidly destroyed. The cyclonic circulation must rather be considered as continuously renewing itself, and struggling against velocities of drift which vary with the altitude."

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair. The following papers were read:—

Mr. W. H. Dines on "*The relation between cold periods and anti-cyclonic conditions of weather in England during the winter.*" There seems to be a generally accepted belief that anti-cyclonic conditions during the winter are likely to be accompanied by exceptional cold, but (for England) the author's observation has led him to the opposite conclusion, and he always expects a frost to break up as soon as the barometer gets much above 30·00 inches. To test the truth of this theory, he tabulated the height of the barometer during all the cold periods during the three winter months of the fifty years 1841-90. Out of 74 frosts, he found that 16 only had a pressure exceeding 30·20 inches, and the majority of these were of very short duration. Thirty-three, or less than half, had a pressure exceeding 30·00 inches. Twenty-one had a pressure below 29·80 inches, and these included almost every frost in the period remarkable for its length or severity.

Mr. A. Lawrence Rotch on "*The use of kites to obtain meteorological records in the upper air, at the Blue Hill Observatory, Mass.*" Three kinds of kites have been used, viz.: 1, the Malay kite, which presents a convex surface to the wind; 2, the Hargrave cellular kite; and 3, a flat kite. with a fin or keel on the front, devised by Mr. Clayton. These kites are attached to a wire carrying self-recording meteorological instruments, and a steam winch automatically distributes the wire on the drum and records its pull. The instruments have been elevated more than one hundred times, and valuable meteorological data as to the changes of temperature, humidity, and wind, up to an extreme altitude of 8,740 feet above Blue Hill have been obtained.

The meteorographs recently employed are an anemo-thermograph, made by Fergusson of the Observatory, and a baro-thermo-hygrograph made by Richard of Paris. These instruments are constructed chiefly of aluminium, and each weighs less than 3 lbs. One of them is hung to the end of a steel pianoforte wire, having a tensile strength of 280 lbs., between two or more kites which are attached

to the wire by independent cords. According to the strength of the wind, other kites can be attached at intervals by a peculiar form of clamp, and serve to lift the wire.

The altitude may be determined by triangulation from two stations at the ends of a base-line, but more easily by one angular measurement at the winch, the length of kite line being known. When the Richard meteorograph is hidden by clouds, differential measures of altitude are obtained from its barometric records. Measurements of the height and thickness of the lower clouds are frequently made by this method.

Kites are greatly superior to captive balloons for meteorological observations, except during calms or very light winds, which, however, seldom extend aloft. Not only do kites cost very much less, but they can lift a light load, such as a meteorograph, much higher in ordinary winds. The Blue Hill Kites fly in all weathers, whenever the wind blows between twelve and fifty miles an hour, whereas captive balloons are driven down by strong winds along an arc whose radius is the lifted cable, and thus transmit violent shocks to the suspended instruments.

Mr. A. B. MacDowall on "*Suggestions of Sunspot influence on the weather of Western Europe.*" The author believes that there is a tendency to greater heat in the summer half-year, and to greater cold in the winter half-year near the phases of minimum sunspots than near the phases of maximum; the contrast between the cold and heat of the year being intensified about the time of minimum sunspots.

THE ICY SAINTS.

We think that it would be good if some investigator would study the subject of low temperatures in May. In France, May 11th to 14th, the fête days of St. Mamertius, St. Pancras, St. Servais and St. Pacôme, are known as the "jours de glace," and the proverb is given in another form in Inward's *Weather Lore*:

"Who shears his sheep before St. Servatius's day loves more his wool than his sheep."

The daily mean temperatures now adopted at Greenwich show a cooling of only about half a degree for the four days, but means do not tell us everything, and it is possible that the cold spell may vary in date, or in intensity. In our number for June, 1891, we reproduced a lovely frost scene of May 18th, and it will be remembered that on May 22nd, 1867, the Derby was run in a snowstorm. We do not suggest that either the 18th or the 22nd has much to do with the 11th–14th—but merely that the whole question is worth study. In 1895 the 11th–14th were hot, but the mean temperature at Greenwich fell to 42°·9 on 17th, and in 1897 the mean temperature in London on the 12th was 42°·6, and for the 11th–13th averaged 43°·6, or 8°·4 below the mean.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	50·3	12	25·4	30	46·0	34·9	36·1	85	80·1	19·1	1·17	10	6·2
Malta	83·0	1	49·4	23	69·2	58·8	55·2	79	124·7	44·4	5·12	14	7·1
Mauritius	83·4	13	65·0	11	81·1	68·9	63·1	70	136·1	55·5	·91	9	5·5
Calcutta	89·7	2	58·0	28	83·6	64·4	62·8	68	147·2	49·6	·05	...	2·1
Bombay	92·8	12	66·2	24	88·2	75·4	70·6	69	139·5	58·3	·53	3	2·8
Ceylon, Colombo	91·0	5	72·2	23	87·4	75·0	73·3	82	152·0	68·3	19·81	27	6·0
Melbourne	97·4	23	36·5	2	74·5	51·4	48·9	67	145·5	24·6	·71	6	5·1
Adelaide	103·4	25	46·5	2	84·2	58·1	47·5	44	162·1	33·5	·52	3	4·4
Sydney	88·0	13	48·6	1	71·7	59·3	58·6	75	147·2	43·8	5·23	22	6·5
Wellington	69·0	25	39·0	2	62·2	48·4	45·4	70	139·0	30·0	2·82	12	4·3
Auckland	72·0	29	46·5	2	64·9	52·1	52·3	82	138·0	43·0	1·63	17	5·3
Jamaica, Kingston	92·3	10	69·4	15	88·9	71·6	68·9	71	...	...	1·40	9	...
Trinidad	91·0	3,19	69·0	13	88·3	71·2	74·1	86	177·0	68·0	9·81	22	...
Grenada	88·0	4	67·2	30	83·1	73·4	74·4	77	155·2	...	20·90	26	5·0
Toronto	63·8	18	17·5	30	47·2	31·9	34·8	78	73·0	12·5	2·95	20	7·6
New Brunswick, Fredericton	60·9	6	— 1·1	23	39·3	22·1	26·8	73	...	...	4·98	16	7·0
Manitoba, Winnipeg	36·5	2	—31·7	30	15·6	—1·7	...	...	...	...	1·31	19	6·5
British Columbia, Esquimalt	56·7	13	16·7	27	40·9	33·6	35·4	90	...	...	10·97	19	7·1

REMARKS.

MALTA.—Adopted mean temp. 62°·7, or 0°·6 above the average. Mean hourly velocity of wind 10·8 miles. Average temp. of sea 69°·8. Lightning on 10 days; thunderstorms on 3 days; hail on 2 days. The shade max., 83°·0, is the highest recorded for November. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, dew point 1°·0, and rainfall ·98in. below, their respective averages. Mean hourly velocity of wind 11·0 miles, or 0·1 above average; extremes, 25·0 on 4th and 2·3 on 3rd; prevailing direction, S.E. by E. to E. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 11 days. A. E. WACKRILL.

Adelaide.—A warm, dry month, the temp. being 4°·3 above, and the rainfall ·48 in. below, the average. C. TODD, F.R.S.

Sydney.—Rainfall 2·02 in. above, temp. 1°·1 below, and humidity 5°·4 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, with fine intervals; wind chiefly S.; the latter part very fine, with moderate and variable winds. Slight thunder on 1st and 11th. Snow on near hills on 1st and 2nd. Hail on 1st and 2nd. Slight earthquake on 27th, at 3 p.m. Mean temp. 1°·2 below, and rainfall 1·35 in. below, their respective averages. R. B. GORE.

Auckland.—A dry month, with an unusual predominance of cold S.W. winds. Rainfall barely half the average of 29 years. Mean temp. 2° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 2·7 miles. Rainfall about half the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·95 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·59	XI.	Rhayader, Nantgwillt ...	5·97
II.	Dorking, Abinger Hall .	1·62	,,	Lake Vyrnwy	5·13
,,	Birchington, Thor	1·78	,,	Corwen, Rhug	2·42
,,	Hailsham	1·87	,,	Criccieth, Talarvor	3·15
,,	Ryde, Thornbrough	2·62	,,	I. of Man, Douglas	2·97
,,	Emsworth, Redlands ...	2·26	XII.	Stoneykirk, Ardwell Ho.	2·37
,,	Alton, Ashdell	1·77	,,	New Galloway, Glenlee	2·75
III.	Oxford, Magdalen Col..	2·39	,,	Lilliesleaf, Riddell	1·47
,,	Banbury, Bloxham	1·42	XIII.	N. Esk Res. [Penicuick]	2·20
,,	Northampton, Sedgebrook	1·90	,,	Edinburgh, Blacket Pl..	1·04
,,	Duddington [Stamford].	1·66	XIV.	Glasgow, Queen's Park..	2·01
,,	Alconbury	1·49	XV.	Inverary, Newtown	3·97
,,	Wisbech, Bank House...	1·56	,,	Oban, The Corran	3·14
IV.	Southend	1·42	,,	Islay, Gruinart School ...	1·27
,,	Harlow, Sheering..... ...	1·79	XVI.	Dollar.....	1·51
,,	Colchester, Lexden	1·66	,,	Balquhidder, Stronvar...	5·47
,,	Rendlesham Hall	1·49	,,	Ballinluig	2·59
,,	Rushall Vicarage	2·02	,,	Dalnaspidal H.R.S.....	3·92
,,	Swaffham	2·42	XVII.	Keith H.R.S.....	·77
V.	Salisbury, Alderbury ...	2·24	,,	Forres H.R.S.	·70
,,	Bishop's Cannings	2·25	XVIII.	Fearn, Lower Pitkerrie..	·82
,,	Blandford, Whatcombe .	3·79	,,	N. Uist, Loch Maddy ...	3·91
,,	Ashburton, Holne Vic...	6·01	,,	Invergarry.....	3·31
,,	Okehampton, Oaklands.	5·05	,,	Aviemore H.R.S.	1·44
,,	Hartland Abbey	3·77	,,	Loch Ness, Drumnadrochit	1·83
,,	Lynmouth, Glenthorne.	4·54	XIX.	Invershin	·63
,,	Probus, Lamellyn	5·03	,,	Scourie	1·94
,,	Wellington, The Avenue	2·79	,,	Watten H.R.S.....	·92
,,	Wincanton.....	3·30	XX.	Dunmanway, Coolkelure	8·55
VI.	Clifton, Pembroke Road	3·68	,,	Cork, Wellesley Terrace	6·00
,,	Ross, The Graig	2·13	,,	Killarney, Woodlawn ...	4·01
,,	Wem, Clive Vicarage ...	1·68	,,	Caher, Duneske	4·17
,,	Cheadle, The Heath Ho.	3·27	,,	Ballingarry, Hazelfort...	4·04
,,	Worcester, Diglis Lock	1·12	,,	Limerick, Kilcornan ...	5·21
,,	Coventry, Kingswood ..	2·18	,,	Broadford, Hurdlestown	3·85
VII.	Grantham, Stainby	1·71	,,	Miltown Malbay	6·85
,,	Horncastle, Bucknall ...	1·28	XXI.	Gorey, Courtown House	4·19
,,	Worksop, Hodsck Priory	1·31	,,	Athlone, Twyford	4·54
,,	Neston, Hinderton	2·03	,,	Mullingar, Belvedere ...	4·36
VIII.	Southport, Hesketh Park	2·73	,,	Longford, Currygrane...	4·26
,,	Broughton-in-Furness ...	3·73	XXII.	Woodlawn	4·39
IX.	Ripon, Mickley.....	1·61	,,	Crossmolina, Enniscoe ..	4·90
,,	Melmerby, Baldersby ...	1·35	,,	Collooney, Markree Obs.	3·40
,,	Scarborough, Observat'y	1·78	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·73	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	1·85	,,	Warrenpoint.....	3·64
,,	Bamburgh	1·14	,,	Seaforde.....	2·57
,,	Keswick, The Bank.....	2·82	,,	Belfast, Springfield	2·77
XI.	Llanfrechfa Grange	4·65	,,	Bushmills, Dundarave..	2·38
,,	Llandovery	3·75	,,	Stewartstown	2·86
,,	Castle Malgwyn	3·23	,,	Killybegs	4·22
,,	Builth, Abergwesyn Vic.	6·01	,,	Lough Swilly, Carrablagh	2·80

APRIL, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·57	— ·17	·23	6	16	67·3	27	27·8	11	2	9
II.		Maidstone (Hunton Court)...	2·04	+ ·39	·80	28	10	...	...	...	...	...	...
,,		Strathfieldsaye	1·53	...	·44	15	16	...	...	...	...	...	...
III.		Hitchin	1·77	— ·02	·43	28	13	66·0	26*c*	26·0	10	5	...
,,		Winslow (Addington)	1·57	— ·35	·31	16	14	68·0	28	26·0	11	3	7
IV.		Bury St. Edmunds (Westley)	2·07	+ ·41	·45	16	15	64·0	29	30·0	6	..	...
,,		Norwich (Brundall)	1·81	...	·29	16*a*	17	67·8	27	27·0	9	6	12
V.		Weymouth(LangtonHerring)	2·92	+ 1·04	·49	11	16	64·0	28	32·0	5	1	...
,,		Torquay (Cary Green)	3·98	...	1·26	26	20	59·9	28	34·3	2	0	2
,,		Polapit Tamar [Launceston]..	3·32	+ 1·10	·44	16	24	65·8	27	29·4	11	1	4
VI.		Stroud (Upfield)	1·81	— ·34	·26	12	20	68·0	28	31·0	4	1	...
,,		ChurchStretton(Woolstaston)	2·21	— ·13	·37	16*b*	20	63·5	27	27·0	5	7	13
,,		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Barkby)	1·67	— ·43	·38	17	17	67·0	29	21·0	4	6	16
,,		Boston	1·29	— ·42	·31	16	15	69·0	29	27·0	11	5	...
,,		Hesley Hall [Tickhill].....	1·59	— ·12	·42	28	15	67·0	29	27·0	5, 11	8	...
VIII.		Manchester(PlymouthGrove)	2·16	+ ·45	·50	16	17	64·0	26	27·0	4	4	4
IX.		Wetherby (Ribston Hall) ..	...	...	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·11	+ ·68	·82	17	16	..	...	...	...	...	...
,,		Hull (Pearson Park).	1·75	— ·17	·36	16	17	67·0	29	27·0	3, 11	11	11
X.		Newcastle (Town Moor)	1·69	— ·14	·44	17	12	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	7·27	+ ·13	1·80	13	14	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	4·30	+ 1·89	·56	17	22	...	...	...	...	1	8
,,		Haverfordwest	4·08	+ 1·45	·71	5	23	62·9	28	30·2	11	1	8
,,		Aberystwith (Gogerddan) ...	4·04	+ 1·48	·73	6	17	64·0	26	21·0	1, 7	8	...
,,		Llandudno.....	3·11	+ 1·30	·55	13	18	59·5	28	33·5	8	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·46	+ 1·23	·92	13	12	60·8	26*a*	24·6	1	9	...
XIII.		Edinburgh (Blacket Place)...	1·04	...	·33	13	13	57·3	29	26·4	3	6	14
XIV.		Colmonell	3·12	...	·87	13	14	63·0	27	24·0	1	...	...
XV.		Lochgilphead (Kilmory)	3·48	+ ·67	·79	13	13	...	...	21·0	1	10	...
,,		Mull (Quinish).....	3·74	+ ·76	·88	13	13	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·60	— ·62	·70	14	7	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·50	— ·55	·55	13	15	59·0	28	27·7	2	8	...
XVII.		Braemar	2·51	+ ·09	1·17	13	14	53·2	22	13·4	3	15	27
,,		Aberdeen (Cranford)	2·51	...	·84	13	17	57·0	29	23·0	2	5	..
,,		Cawdor (Budgate)	·79	— ·73	·20	15	12	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·92	+ ·11	·73	16	9	...	...	...	...	..	...
,,		Glencarron Lodge.....	4·14	...	·78	13	15	57·7	27	23·0	2	12	...
XIX.		Dunrobin	·68	— 1·05	·23	12	8	53·0	28	27·8	3	4	...
,,		S. Ronaldsay (Roeberry).....	1·42	— ·19	·56	13	17	54·0	17	27·0	1, 2	4	...
XX.	IRELAND.	Darrynane Abbey.....	5·69	...	·80	12	23	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·05	+ 2·58	·86	12	23	61·0	28	31·0	2	1	...
,,		O'Briensbridge (Ross)	5·19	...	·54	3	20	..	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·63	+ 1·35	·47	5	22	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·49	+ ·37	·42	20	22	59·7	28	29·9	2	1	4
XXII.		Ballinasloe	4·78	+ 2·44	·58	16	23	58·0	26	30·0	1, 2	5	...
,,		Clifden (Kylemore)	7·38	...	1·14	5	19	...	...	...	...	..	...
XXIII		Waringstown	3·24	+ ·82	·75	15	19	63·0	29	26·0	2	7	13
,,		Londonderry (Creggan Res.).	2·24	·00	·33	29	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·92	+ ·69	·40	20	19	60·0	26	26·0	1	6	16

+Shows that the fall was above the average ; —that it was below it.

a—and 28. *b*—and 17. *c*—and 27.

METEOROLOGICAL NOTES ON APRIL, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—Cold, ungenial weather until the 26th, when there was a considerable rise in the max. temp. On the afternoon of the 16th a sharp TS occurred, and another on the evening of the 28th. Mean temp. just one degree higher than the mean of March. The cuckoo rather early, heard on the 15th. Swallows seen on same date. Nightingale later, not heard until 24th. S on 1st and 7th. H on 30th.

BURY ST. EDMUNDS, WESTLEY.—The month was cold, with the exception of the 13th till the 26th, then warm till the end. A violent TS occurred on the 28th, with unusual darkness about midday, very heavy in Mid-Suffolk. The migratory birds came at their usual times. Distant T on 7th and 17th.

NORWICH, BRUNDALL.—Rainfall ·14 in. above the average; mean temp. slightly below. Prevailing winds from N.E., S.E., and S.W. The early part of the month was very ungenial, with S on 1st, 2nd and 5th. Windy weather and cool for the season till the fourth week, when some warm days alternating with heavy rains forced on vegetation.

WEYMOUTH, LANGTON HERRING.—Rainfall for the first four months of the year, 58 per cent. above the average. Average temp. at 9 a.m., 47°·1, or 0°·4 below the average of 25 years. Solar halos on 11th and 20th. Fogs on 9th, 27th and 28th. TS on 26th.

TORQUAY, CARY GREEN.—Rainfall 1·64 in. above the average. Total rainfall of the first four months 4·81 in. above the average. Mean temp. 47°·5, or 0°·7 below the average. Duration of sunshine 139 hours 35 minutes, being 43 hours 55 minutes below the average. Total sunshine of the first four months 86 hours 40 minutes below the average. The R of the 26th, 1·26 in., all fell in five hours, between 5 p.m. and 10 p.m.

POLAPIT TAMAR [LAUNCESTON].—Unusually wet for April, also a cold month generally. For the fortnight from the 11th to the 24th strong winds to half gales were prevalent. H storms on 6th and 7th. Distant L on 26th.

STROUD, UPFIELD.—Sleet on 1st. Gales from S.E. on 3rd, and from S.W. on 14th and 17th. T on 28th.

WOOLSTASTON.—A backward month. The first week very cold, with S storms on 1st and 6th. First swallow on 11th; cuckoo on 21st. T and L on 28th. Mean temp. 44°·1.

LEICESTER, BARKBY.—A rather cloudy and windy month. Mean temp. 45°·4. T on 16th and 28th. S on 6th and 7th. Cuckoo heard on 13th; swallow seen on 17th.

HULL, PEARSON PARK.—H on 2nd and 4th. TS at noon on 16th.

WALES.

HAVERFORDWEST.—The first four months of this year have produced 16·74 in. of rain, the general characteristics being constant wet and mildness. In 1867 the rainfall for the first four months was 26·55 in., character constant wet and severity, S forming a large portion of the fall. In 1872 constant R and mildness characterized the first four months, the fall being 23·34 in. So during the last 48 years there have been two notably wetter springs than the present. April this year has been remarkable for constant R, but never any very heavy fall.

S on the 1st. Lunar halos on 10th and 15th. Aurora on 11th. Vegetation very forward; ash and oak both out, ash the earlier. Prevailing winds from S.E. 19 days, S.W. 9 days.

ABERYSTWITH, GOGERDDAN.—A cold and stormy month, with very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, rainy, sunless month, resembling in almost every particular the exceptionally unpleasant April of 1877. The mean Bar. pressure has only been less in six, the mean temp. lower in five, the rainfall greater in six, and the sunshine less in two, out of the 38 years over which observations extend. The mean temp. is only 1°·7 higher than that of February, while the mean min., 34°·7, is actually lower than that of either February or March. Easterly winds prevailed on 21 days. Heavy S showers occurred on 15th. The total R for the first four months of the year, 14·24 in., is only ·71 in. above the average for that period. Vegetation is unusually backward, fully three weeks later than last year.

COLMONELL.—Rainfall ·81 in. above, and mean temp. 0°·4 below the average of 21 years. Heavy S shower on 1st; S on 14th; T on 14th and 15th.

MULL, QUINISH.—The week from 11th to 18th was exceptionally wet and stormy. Tremendous H showers, with T and L, from S.W. on 14th, 15th and 16th.

BRAEMAR.—A very cold and backward month.

ABERDEEN, CRANFORD.—This month has been cold, with little sunshine.

S. RONALDSAY, ROEBERRY.—A very cold month. Mean temp. 41°·6, being 2°·6 below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—Another very wet month, and cold, except the last few days.

WATERFORD, BROOK LODGE.—Showers of S on 1st; heavy H showers on 6th; H and S on 14th. Swallows seen on 24th; cuckoo heard on 26th.

O'BRIENSBRIDGE, ROSS.—The wettest April for 30 years, but exceeded in 1867, when 6·43 in. of R fell. Temp. very low during the month, and gales frequent and heavy. Everything late.

DUBLIN.—A cold, changeable, rainy month. The amount of cloud was 12 per cent. in excess of that of April, 1896. Mean temp. 45°·9, or 1°·8 below the average. Fog on 21st. High winds on 16 days, reaching the force of a gale on 3rd and 10th. H fell on five days. Solar halos were seen on the 8th and 16th. Lunar halos on the 10th and 15th. S or sleet fell on the 1st and 14th.

WARINGSTOWN.—A very backward season.

OMAGH, EDENFEL.—Until the 21st the weather of April was a continuance of the extremely wet and unsettled weather of March, with the addition of a decreased instead of an increased mean temp.; as a result, vegetation, even of trees, absolutely stood still, as might also be said of all kinds of farm labour. The fourth week, however, was fine and generally dry and clear, and much agricultural work was overtaken; but the month ended in a return to the rainy and unsettled condition prevailing now for so many months.

NOTICES.

It is requested that all Books for Review, and Communications to the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE OBSERVATORY

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers),

NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVII.] JUNE, 1897. [PRICE FOURPENCE, *or 5s. per ann. post free.*

HAILSTORM AT SEAFORD, SUSSEX, MAY 30TH, 1897.

IT is very rare for it to be possible to prove that in England, over a considerable area, a shower of hailstones has fallen each of which was as large as a hen's egg. This we are in a position to do, thanks to the following correspondence, and to two different photographs with which also we have been favoured. We intend to give (1) letters received from observers personally known to us; (2) verbatim reprints from local and other newspapers; (3) condensed notes from various sources; (4) a brief commentary on the whole.

To the Editor of the Meteorological Magazine.

SIR,—As I have not seen in a London or other paper any notice of a curious storm here, last Sunday, May the 30th, I send you some remarks in case you care to note them.

It had been an exceedingly hot day, with scarcely a breath of wind on the high cliffs towards Beachy Head, and during the afternoon light clouds covered the sky. At about 6.30 p.m. a dark cloud, with two long streamers apparently issuing from the sea, approached from the south, and on nearing the shore the calm surface of the water was suddenly covered with heavy splashes, as if a vast shower of big stones had been thrown in. Half a minute later hailstones fell on the land, varying in size from that of a small marble to four or even five inches round. The large stones all had a round nucleus of opaque white frozen snow, about half-an-inch in diameter, and this was surrounded by a ball of transparent ice. As these ice-balls of the largest size fell on an average ten feet apart, they did not do so much damage as would have taken place had they been closer together, but they broke every pane of glass exposed horizontally to their force. After the hail had fallen for two or three minutes, another five minutes of very heavy rain followed, and when I ran out, on this ceasing, to pick up two big hailstones which I saw on the road, I found on measuring them that they were 4½ inches round. As these had been exposed fully seven minutes on the ground, and for five out of the seven to rain, I conclude that they were

originally somewhat larger. When the storm was over, very many persons came out and collected the large hailstones in bags; I wondered why.

In 1846 a similar storm occurred at Herne Hill, where my father lived, and in a very few minutes glass in his conservatories to the value of nearly £400 was destroyed, but I do not remember any other.

The glass used now is much stronger than it was in 1846, and in greenhouses especially; I noticed that last week the window-panes escaped very generally, whereas I am sure they would have been broken had the old glass been there.

It appears that the hail was most local, for it did not fall two miles off East or West.—Most sincerely yours,

A. S. BICKNELL.

5, Esplanade, Seaford, Sussex.

SIR,—The weather on 30th, though very warm, was lovely in the morning and afternoon; but towards 5 p m. clouds began to draw up from the S.W., and about 6 p.m. there was distant T, which came closer. I counted 14 slowly between the L and the T. The remarkable feature was the large H; a quarter of an hour after the stones had fallen I saw three each measuring $1\frac{3}{4}$ in. by $1\frac{1}{8}$ in., slightly flattened and with a nodulated surface. A friend picked up several $4\frac{1}{4}$ in. in circumference. Several of the large ones left in a hot kitchen for four hours were found to have melted only to the size of small marbles; must not the ice have been exceptionally cold? Twigs and branches were cut off as with a knife, and much glass was broken.—Yours truly,

York House, Seaford, May 31st. A. ALDAM MOON.

SIR,—Reports having reached me respecting the severe hailstorm which swept across this county on Sunday evening, May 30th, I am induced to send you the following account, furnished to me by the Rev. Chancellor Parish, of what occurred at his Vicarage of Selmeston, near Polegate.

> "I am anxious to describe, as well as I can, the hailstorm which fell upon us yesterday (May 30th), as I am sure you must have watched it from a distance with great interest. The storm clouds drew up from the S.W., and I remarked them about 2.30, but they advanced slowly till they appeared all around us; at about 6 p.m., I came indoors and made my notes of the services of the day, &c., I then observed that it became vary dark, and suddenly, between 15 and 20 minutes past six, a terrific storm of wind and rain swept down upon us. I walked to the window of my study to look at it, and the rain changed to hail, and the stones became larger and larger till their size was quite alarming. The whole duration of the storm was, as near as I could guess (without having timed it),

six minutes or seven—viz., two minutes rain; one minute ordinary hail the size of a pea (diameter 0·1 in. to 0·2 in.); two minutes larger stones, the size of small marbles (diameter 0·4 in. to 0·5 in.); two minutes largest size of irregularly oval shape, (about 1½ inches by ¾ inch). My drawing-room window and door were wide open, and the storm swept right through. Twenty-five panes of glass were completely smashed, and the shattered fragments were scattered all over the room. The floor was covered with hailstones. The noise was tremendous, and almost silenced the sound of the thunder, which was incessant. As the storm approached, some swallows made immense and successful efforts to get *above it*. They went almost straight up in the air, and when the storm suddenly ceased, there they were—high and dry. I should like to have seen it from their point of view. One feature was the surprising way that the stones bounded straight up off the lawn, more than two feet, I judge by the height of my railings. The rainfall here was only ·31 in. as measured at 9 a.m., 31st."

At Sherrington Manor, a short distance from Selmeston, sad havoc was made upon the conservatories and hot-houses, not only the glass being broken, but the valuable plants very much injured.

From Crowborough I watched the progress of the clouds for some hours. Very heavy electric clouds appeared over the South Downs, near Newhaven, soon after 3 p.m., and for some time remained almost stationary. A rather strong easterly wind was blowing over Crowborough Hill at the time, which seemed to prevent the storm advancing in our direction; this wind at last increased in force, and apparently drove back the advancing clouds upon the main mass of the storm. Soon after six p.m., a line of nimbus cloud, two or three miles in length, of a whitish appearance, exhibited a well-defined edge on the northern side, and any further advance of the storm in our direction was checked. After passing over Seaford and Selmeston, it rapidly increased its pace, and finally disappeared to the eastward.

A rain storm, which passed over Crowborough from 6.55 to 6.59 p.m., came from quite another direction, viz., from the N.W. It came on quite suddenly with a vivid flash of lightning and unusually loud thunder. The rain fell in torrents for four minutes, when it ceased as suddenly as it had commenced. The rainfall was just ·30 of an inch in the time. No hail fell here.

I enclose some newspaper cuttings respecting this storm, and also a photograph of a group of hailstones which fell at Seaford, in fac-simile size. Such large hailstones have not fallen in Sussex since Aug. 23rd, 1855, when they were ordinarily the size of pullets' eggs, and some much larger, measuring from three to six inches in circumference.

Yours truly,

C. LEESON PRINCE, F.R.Met.S.

The Observatory, Crowborough Hill, June 5th, 1897.

REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—It would be interesting to know whether other places experienced the wonderful storm which visited us last Sunday, May 30th. At about 6.30 p.m. there fell for the space of some minutes a shower of hailstones varying in size from a hen's to a pigeon's egg, some of which weighed three-quarters of a pound each,* and measured over 5 in. in circumference. They had the appearance of balls of ice, with a coarsely granulated surface, and the centre of each was rayed like a crystalline star. The sight was a memorable one, and the damage done to the glass in the town and neighbourhood was very considerable.—Yours, &c., E. DEVERSON.

Seaford, Sussex, June 5th.

A SHOWER OF ICE.

ON Sunday evening, Seaford and the immediate district to the westward, were subjected to a sort of bombardment by a furious shower of ice, large frozen lumps and fragments crashing down with tremendous force, for a brief space of time. A hailstorm in summer is an unusual event, but a storm, whose hail consists, as it did on Sunday, of pieces of ice, most of which were considerably more than an ounce in weight, is a marvellous occurrence—at least in this country. In the tropics, according to travellers' tales, such a hail would not be regarded with surprise. Many of the hailstones which fell on Sunday were globular in shape, and were as large as a golf ball, though a few were equal in size to a small orange. Several of these, on being examined, were seen to have cores from which radial lines extended. Others were as large as a hen's egg, while some were angular in shape. Hailstones which were compared to cocoa-nuts for magnitude, were reported to have fallen, but their apparent size seems to have been due to the spectacles through which they were viewed. Ten "stones," picked up without making any selection as to bulk, weighed a pound, *and one was found which turned the scale at four ounces.* Others were put into the scale with the object of ascertaining the quantity of fluid resulting from liquefaction, and one was said to have filled, when melted, a "three measure of Scotch," whatever that may be, but a small wine glass, which the water from another filled, is a vessel whose capacity will be more generally understood. The shower of ice lasted only a few minutes, but it is scarcely necessary to state that it practically wrecked every greenhouse in the district. Much damage was also done to glass in a perpendicular position, and many

---

* This is a mistake, or misstatement. The *dimensions* given by the writer agree with those of other persons, and with the photographs, but the *weight* is at least three times too great. "Three-quarters of a pound" of ice is about 22 cubic inches; but the largest hen's egg may be taken as 4 cubic inches, and if so, then the "¾ lb." is about five times too great. Probably the writer meant 3 oz., which would be very probable.—ED. *M.M.*

P.S.—We are glad, at the very moment of sending this for press, to be able to clear up the puzzle. We communicated with the writer, and find that *three* weighed ¾ lb., so that they averaged 4 oz. each; and she adds that several which she "handled were certainly much larger than hen's eggs"; this agrees very well with the "4 oz." She "heard of" five turning the scale at 1½ lbs., i.e., 4·8 oz. each, but did not see it. Our correspondent mentions also the extreme density of the ice to which attention is drawn on p. 66.—ED. *M.M.*

windows in the houses along Claremont Road, and on the Queen's Park, were broken. At the Buckle—the unfortunate Buckle—the windows were riddled, and nearly every pane of glass in the Buckle Inn was smashed. Much poultry was killed.

The phenomenon, for only as such can it be described, occurred about a quarter to seven p.m. The afternoon had been very hot and sultry, and a dense bank of black clouds had become massed in the south-west. About six o'clock the reverberations of a distant thunderstorm were heard; the storm gradually approached, and then a funnel-shaped cloud—apparently a water-spout—was seen to detach itself from the black mass in the south-west; it crossed the bay in a northerly direction with terrific rapidity, and heralded by a violent eddying wind, and accompanied by blinding flashes of lightning, it swept over the land, its track being marked with rolling volumes as of smoke, while there descended a tremendous shower of ice, the clatter of which was almost awe-inspiring by its strangeness. The full force of the storm, however, seems to have been felt along the Bishopstone Valley, and *even on Monday, Norton Top, with its covering of ice, glittered in the sunlight like an Alpine peak.* Chyngton and Sutton, on the other hand, were just on the edge of the path of the storm. The oldest inhabitants, some of whom have very prodigious memories, have no recollection of such a phenomenon in the past, and doubtless an account of the shower of ice on Sunday will be handed down to posterity as an interesting item in the annals of local history. Mr. W. R. Wynter, of Seaford, has on sale some exceedingly fine photographs of groups of the hailstones, which he has taken.

SEAFORD.

A HAILSTORM of unusual violence was experienced at Seaford on Sunday evening—such a storm, in fact, as one hears of as occurring in other lands, but which one scarcely believes, and, unless seen, can hardly realise. The day had been beautifully fine, calm, and warm, but towards six o'clock a bank of clouds was seen to be moving up from the sea, and after a short time the appearance of these clouds was most peculiar. Suddenly there was a great gust of wind, and for two or three minutes great blocks of ice fell. Some of these exceeded six inches in circumference, while they weighed as much as two ounces each. They were of varied shape, some being round, others being long, but all were of immense size. The services at the various places of worship had just commenced, and the sound of the large blocks of ice falling on the roof reverberated through the buildings, so that the proceedings could scarcely be heard, while many of the congregation were considerably alarmed. Much damage was done to windows in the district, while the greenhouses suffered to a great extent, many of them having 50 and 100, or even more, panes broken. Such a storm has not been experienced by the oldest inhabitant.—*Brighton Observer*, June 4th.

RIPE.

TERRIFIC HAILSTORM.—On Sunday evening a hailstorm of remarkable violence broke over the district of Ripe and Berwick, the hailstones being of exceptional size, some of them being almost round and measuring as much as two inches in diameter. Much damage was done to greenhouses and other glass

structures in the gardens, and many young ducks and geese were killed outright, while the older birds suffered terribly from the force of the hailstones, a number having their eyes completely smashed. The service in the Parish Church at Ripe had to be stopped for a time at the height of the storm, as it was quite impossible to hear anything in the church but the incessant rattling of the hailstones on the roof. The storm appears to have passed through the Cuckmere Valley, in a line from Seaford to Heathfield, reports of the fall of hailstones of abnormal size having been made at each of these places. Curiously enough, just at the mouth of the Cuckmere river scarcely any hail fell.

SHORT NOTES TENDING TO DEFINE THE AREA OF THE STORM.

Berwick.—At Sherrington Manor the damage to glass is said to be £100.

Brighton.—No hail.

Eastbourne.—No hail.

Hailsham.—No hail.

Jevington.—No hail.

Littlington.—No hail of importance, and R only 0·04 in.

Selmeston.—Much damage was done here. Hail came down with terrific force. The stones were of enormous size, some measuring five inches in circumference, and weighing over an ounce. Panes of glass were broken in all directions, in cases of exposed cottages every pane being smashed, branches were broken off trees, young rooks were knocked dead from their nests, while ducks and fowls were killed in considerable numbers. Crops and vegetation suffered heavily.

OTHER STORMS IN SUSSEX.

Haywards Heath.—The feature of the thunderstorm here was the heavy downpour of rain, which flooded the lower portions of the town, the water rushing along the roads like little rivers. The manholes in the Mill Green Road were forced up, the water spurting several feet.

Wadhurst.—A terrific storm of T and H, the latter being very large indeed, passed over here. Considerable damage was done to fruit trees and vegetables, the roads were strewn with fallen leaves, and scarcely a house in the town but had several windows broken. The storm appears to have been very local, as in some parts of the parish there was no hail.

STORMS IN KENT THE SAME EVENING.

Bexley Heath.—This neighbourhood did not escape the severity of the storm on Sunday, but fortunately no serious damage resulted. A large limb of a tree in the Broadway was torn off by the severity of the storm.

Dartford.—Here, at Gravesend, and in the surrounding district, between seven and eight o'clock on Sunday evening, the storm occasioned darkness for a time, and there was a perfect deluge of rain. A large elm tree was blown down at Hawley, and considerable damage was done to the fruit trees in the neighbourhood, especially in the vicinity of Wilmington.

Gillingham.—At the Wesleyan Chapel two windows were broken with the hail, quite 1 in. in thickness. In Layfield Terrace, no fewer than 40 windows

were broken, and great damage was done in other outlying parts. The northern portion of the storm that passed over Strood-hill does not appear to have been so severe. In the town, except a few brilliant flashes of lightning and heavy claps of thunder, little was felt of the effects of the storm.

Hunton.—The hops on Stone Wall Farm escaped damage, but considerable injury was done to over 100 acres on the Hunton Court Estate, and about the same on Buston and Grove Farms. At Buston Farm the ground was covered with gooseberries. In several houses panes of glass were broken—at Mr. O. Foreman's no fewer than 15 squares were broken. Mr. Foreman says he found hailstones weighing an ounce.

Maidstone.—Soon after six a heavy mass of clouds congregated over the town, and lightning and thunder became excessively bright and loud, and hailstones fell as large as walnuts, doing immense damage. The storm travelled eastward from Maidstone, but opened and passed each side of Blue Bell-hill.

REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—In reply to your Correspondent relative to remarkable hailstones, I may state that the same hailstorm passed over this town between seven and 7.30 p.m. on Sunday, May 30. The hailstones were similar in size to those your Correspondent describes. The noise of the hail was so great that the services in nearly all the churches were interrupted. I was myself taking Service at one of our district churches, and had to signal to the congregation to sit, as it was impossible to continue the hymn we were singing, no sound being heard of either music or voices above the clatter of the hail. It was accompanied by sharp flashes of lightning, but the thunder was inaudible from the same cause. Twenty minutes after the storm had ceased, when we came out from Service the hail stones were still lying in heaps by the roadside as large as shillings, and had rings of opaque white in the lumps of ice like cat's eyes. Great damage must have been done to the hops, and to glass, as well as to the fruit.—Yours, &c.,

E. DALISON.

St. Michael's, Maidstone, June 9th.

Rainham.—Here and at Bredhurst, Boxley and New Brompton hailstones fell of an immense size. In New Brompton the streets were covered with these hailstones, which took some time to thaw.

Sevenoaks.—The storm on Sunday night was very keenly felt here. The water rushed in torrents down the hills, and the thunder was very loud, while the lightning was awfully vivid and frequent. A large tree in Hitchen Hatch-lane was struck by lightning, and fell right across the road. The Town Surveyor (Mr. J. Mann) at once employed some men to remove the obstruction, but this could not be done until the tree had been sawn into pieces, and the branches lopped off. Oak-lane was completely flooded for a short time.

Tenterden.—A thunderstorm of short duration passed over this neighbourhood on Sunday evening. An oak tree near Smallhythe School was struck by the lightning, having the bark on one side taken clean off. A sheep was killed in a field not far distant.

STORMS AND DAMAGE IN OTHER COUNTIES.

NORTHAMPTON.—*Oundle.* The TS was so severe and the streets were so flooded that many persons could not leave the church after service.—*Peterborough.* Heavy TS, with much R, after 7 p.m.; streets flooded.

ESSEX.—*Clacton.* TS at 9 p.m., but not much R. *Colchester.* Brilliant L between 8 and 9 p.m. ; not much R.

SUFFOLK.—*Bury St. Edmunds.* Sharp TS and heavy R about 9 p.m.

LINCOLN.—*Billingborough.* Heavy TS.—*Walcot.* Sheep killed by L.—*Deeping St. James.* Youth killed by L while driving, horse not hurt.

GENERAL CONCLUSIONS.

Over England E. of a line from the Isle of Wight to Lincoln thunderstorms of more or less intensity occurred between 5 and 9 p.m. on May 30th.

The principal ones were in Kent and Sussex.

By far the most noteworthy occurred over an area less than 4 miles from E. to W., about midway between Newhaven and Beachy Head, and 8 miles from S. to N.; how much less than this area there is not at present evidence to prove.

Neither the T and L nor R was exceptional. but the H was so.

THE SIZE OF THE HAILSTONES.

There is a general consensus of opinion that the circumference of the large ones exceeded 4 inches, and two different photographs sent to us give respectively 7·8 in. and 6·4 in. as the circumference—this of course gives a diameter of about 2 inches, and as they were mostly somewhat oval, we think that they must have been (as they appear in the photographs) very nearly the size of an ordinary hen's egg—say 2¼ in. by 1½ in. by 1 in. They would, therefore, contain about 4 cubic inches of ice, and weigh very nearly 2 ounces each. It will be noticed that one writer says that ten weighed a pound—this would give 1·6 ounces each, and agrees very closely with our estimate of the size. We see that one is stated to have weighed "nearly a quarter of a pound," and another account says "three or four ounces." We have no doubt that the largest exceeded two ounces, and think that probably a very small number reached three ounces, but we see no evidence which will induce us to go to "four" ounces. In size, shape, and weight these stones seem to have closely resembled those which fell at Richmond, Surrey, August 3rd, 1879,* and at Richmond, Yorkshire, July 8th, 1893,† but if these falls are to be classed according to the magnitude of the stones, we think that Richmond, Surrey, would be first, and if by number of large stones, Richmond, Yorkshire, would be first. It is, however, certain that the Seaford fall was quite an exceptional event.

* *Met. Mag.*, Vol. XIV., p. 97.

† Russell, Rollo, *On Hail.* Photographs facing p. 224.

HEAVY RAINFALL AT PORT ELIZABETH, CAPE COLONY, MAY 5TH, 1897.

FROM copies of the *Port Elizabeth Advertiser*, of May 8th, and of the *Cape Times*, of May 12th, with which we have been favoured, we have compiled the following note.

There had been a drought for some months in the neighbourhood of Port Elizabeth. On the night of Monday, May 3rd, the wind went to S.W., black clouds came up from the ocean, and there was steady rain, giving at the Hill station 0·53 in., up to 8 a.m. on the 4th. During the 4th, and up to 8 a.m. on the 5th, intermittent rain gave a total for the 24 hours of 1·34 in. It was raining hard at 9 a.m. on the 5th, but towards 11 a.m.

"the sky grew blacker away to the westward, and the rain began to come down in real earnest. At noon every street in the town was inundated, every sluit and gully was the course of a foaming torrent, and the low lying clouds were discharging their watery load in such amazing quantity that one would truly have believed that 'the fountains of the great deep were broken up and the windows of heaven opened.' The lower part of the town was for a couple of hours converted into a reservoir, fed by millions of gallons of rainwater plunging madly, feet deep, down every steep descent from the larger "catchment area" above the crest of the hill. Things were bad enough on the level surface above the Reserve, but the scene was tame compared with what we saw in every avenue leading to the lower level. The Park and all the district between the valley and the location, were a swamp. Rain fell absolutely in solid masses, and in finding level the floods of water did incalculable, almost incredible, damage. Down White's Road, Donkin Street, Constitution Hill, and Russell Road came seething, roaring, waist-deep cascades, ripping up roadways and footpaths and paved sluits like channels of sand; tearing great gaps in the surface, scooping out hundreds of tons of subsoil, laying bare and smashing gas and water mains and pipes, and hurrying along on their red and discoloured surface great boulders, beams of wood, lumps of asphalte, and everything that was loose, no matter what its weight, to deposit all this *débris* in wild confusion on the surface of Main and Strand Streets. In the former thoroughfare, about half-past twelve midday, the scene was really grand, though not without a touch of awe at this outbreak of Nature's resistless forces. Down every slope of road or lane were rushing muddy torrents, in many places waist-deep; the rain was driving along from the N.W. in sheets, forming a watery curtain which no eye could pierce for more than fifty yards; rocks and stones were being hurled into the middle of the road with the rattling roar one hears only on a shingle beach when heavy seas are breaking; on the low side the pent-up flood was finding its way into stores, cellars, hotels, and sheds, despite every effort to stay its inrush; and a few hardy people, drenched to the skin, gathered under the lee of corner buildings to watch the grandly-gloomy scene, or waded along the drowned footpaths, too wet to care for the extra soaking. So the storm raged for an hour or more, until a shift of wind to about N.E. brought relief; the surcharged clouds drove away out to sea, and by half-past one the sun was shining hotly in a clear sky. Such a waste of desolation in the leading thoroughfares of Port Elizabeth that same sun has never before shone upon. From Market Square to North End, Main Street at short intervals resembled

nothing so much as a stretch of rough foreshore—sand was deposited several inches deep on the lower side, while the roadway was strewn with (no exaggeration) hundreds and hundreds of tons of stones, boulders, and gravelly *detritus* washed down from above."

The rainfall between 8 a.m. and 1.30 p.m. on the 5th was 5·32 in., and the observer says that, but for the wind sweeping the rain over, rather than into, the gauge, the total would have been six inches in six hours.

During the ten years 1886–95, the largest yearly total was 27·94 in. in 1888, and in 1895 the total for the year was only 16·88 in.

At the Van Staaden Waterworks Reservoir the fall was much less, the fall on the 5th being 3·65 in., against a total at Hill station of 5·44 in. From the following little note the fall seems to have been local :—

RAINFALL.

The following rainfall returns, measured at eight a.m. on 4th, 5th, and 6th May, 1897, are supplied by the Meteorological Commission : Cape Agulhas, 0·20 inch ; Cape St. Francis, 3·75 inches ; Port Elizabeth, 7·29 inches ; East London, 0·75 inch ; Durban (5th), 0·30 inch.

REVIEWS.

The Great Lakes as a Sensitive Barometer. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

A Probable Solution of the Secondary Undulations found upon Self-recording Tide Gauges. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

THESE are two early notes respecting a study of the seiches on Lake Huron, not merely in connection with the traces of a photographically recording barometer, but also with the weather types prevailing at the time over North America. The author is improving his appliances for observation by adding an extra sensitive barometer and in our opinion the inquiry is likely to bear good fruit. Mr. Denison's paper is, we think, the first in which the principal authorities upon the subject have been brought together—from Duillier in 1730 to De Saussure 1779, Vaucher 1804, Forel, Studer, Meyer, Favre, Veine, Guthrie, Kelvin, and Helmholtz. We can suggest one name—and one only—to be added to this list—viz., that of Mr. H. C. Russell, F.R.S., who has long been studying the oscillations of Lake George, which is about 130 miles S.W. of Sydney, New South Wales. In completing his work the author may find it useful to consult the paper by Sir John Lubbock "On the Fluctuation of High Water due to changes in the Atmospheric Pressure," (Phil. Mag. 1837, pp. 195, 196) ; J. C. Ross "On the effect of the Pressure of the Atmosphere on the Mean Level of the Ocean," with 2 plates, (London, 1854, 4to, 12 pag.) : Mr. W. H. Wheeler's report to the British Association (Liverpool, 1896), "On the effect of Wind and Atmospheric Pressure on the Tides," and a paper by M. F. L. Ortt, of The Hague, in *Nature*, May 27th, 1897.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday afternoon, May 19th, at the Rooms of the Royal Astronomical Society, Burlington House, Mr. E. Mawley, F.R.H.S., President, in the chair.

The first paper read was by Mr. C. V. Bellamy, "*On the Rainfall of Dominica, West Indies.*" After a brief description of the physiography of the island, the author discussed at length the rainfall at about 20 stations for the four years 1893 to 1896, illustrating the distribution by a shaded map. The Trade Wind, blowing from the Atlantic and bearing a vast amount of aqueous vapour, is intercepted by the ranges of hills, so that the country on their windward or eastern slopes receives the greatest amount of rain, while that on the leeward or western side of the island is the driest. The map shows a mean fall over the western coast districts of from 60 to 90 inches, over the north, west, and south coast districts of from 100 to 150 inches, and over the central area, the fall is greater, probably exceeding 200 inches. Table VI. gives the mean monthly rainfall for the four years; it shows that the rainy season extends over the months of July, August, September, October, and November; the remaining seven months representing the dry season. The mean monthly rainfall varies from 4·46 in. in February to 15·84 in. in November. The author expresses the opinion that hurricanes are of less frequent occurrence now than formerly.

The second paper was by Mr. R. H. Scott, F.R.S., and Mr. F. Gaster, "*On the Mean Monthly Temperatures of the British Isles.*" The authors dealt with the means of the daily minimum, average, and maximum temperatures for the various months of the year, in the 25 years 1871—1895. They pointed out that there is a great difference between the amount of range of temperature at the coast stations and that recorded inland. The range between January and July amounts to about 16° at coast stations, but to more than 23° at inland stations. The contrast between the temperature of the air at inland and at coast stations at different times of the year is due to the following causes—(1) The constant tendency of the sun to heat the surface of the earth; (2) the equally constant tendency of the earth to radiate its heat into space—both of these being modified greatly by the aqueous vapour and the clouds suspended in the atmosphere; (3) the fact that the solid portions of the earth absorb and reflect heat much more rapidly than the water; and (4) that while the ocean to the westward is of enormous size and great depth, the sea to the eastward is, comparatively speaking, limited in area and shallow, and separates the eastern shores of the British Islands from those of continental Europe by only a small distance.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	51·8	26	26·6	19	44·5	34·3	36·4	87	61·1	20·8	3·61	21	7·4
Malta	68·6	7	43·6	2	62·3	52·3	50·1	82	117·2	38·0	3·99	11	6·8
Mauritius	86·6	19*a*	65·6	2	84·8	71·9	67·0	72	136·4	55·4	1·15	7	5·8
Calcutta	83·7	1	45·5	22	78·0	54·7	52·4	62	139·0	35·3	·00	0	2·0
Bombay	90·0	20	63·2	31	85·9	71·9	65·4	65	136·8	51·9	·00	0	2·5
Ceylon, Colombo	90·2	...	70·5	14	87·5	74·0	72·5	81	146·0	68·0	11·76	22	6·2
Melbourne	98·9	23	47·0	15	78·3	56·3	52·6	63	153·8	35·0	1·16	6	5·5
Adelaide	104·4	22	48·0	7	83·6	59·3	50·8	50	164·0	37·0	1·48	4	3·8
Sydney	101·4	28	58·4	8	77·8	64·4	58·7	70	156·0	52·8	1·50	12	5·4
Wellington	77·0	29	44·0	25	68·1	56·1	53·0	72	133·0	35·0	2·61	8	4·3
Auckland	83·0	14	53·0	5	74·4	59·6	57·1	70	147·0	51·0	·88	6	4·0
Jamaica, Kingston	90·9	6	66·8	30	87·6	71·0	68·7	74	...	...	2·14	9	...
Trinidad	91·0	2	67·0	27	87·0	70·1	72·2	82	167·0	66·0	6·33	15	...
Grenada	86·0	4	71·0	1	82·3	73·5	72·6	81	155·0	...	11·12	25	4·0
Toronto	48·9	12	1·1	23	33·8	21·3	24·2	80	60·0	— 2·0	·95	9	7·1
New Brunswick, Fredericton	44·9	14	—10·7	23	24·6	5·6	11·0	72	...	...	1·18	7	3·5
Manitoba, Winnipeg	40·0	11	32·7	1	20·6	0·8	...	...	...	...	·27	5	5·3
British Columbia, Esquimalt	55·0	8	29·0	16	46·8	38·5	41·8	95	...	...	10·41	24	8·8

a—and 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·5, or 0°·2 above the average. Mean hourly velocity of wind 11·4 miles. Thunderstorm and hail on 20th. Average temp. of sea 62°·5. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 above, of dew point 0°·9 below, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 10·9 miles, equal to average; extremes, 24·7 on 20th and 1·6 on 22nd; prevailing direction, E.S.E. to E. by N. Lightning on 4th, 8th, and 29th. Rainfall the least fall in December from 1875 to 1896. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on 10th and 11th; thunderstorms occurred on 17th, 18th, and 19th. ALFRED E. WACKRILL.

Adelaide.—Mean temp. 0°·4 above the average of 39 years. The severe drought continued until early morning of 27th, ·72 in. of R being recorded at 9 a.m. 27th, and ·70 in. on 28th; the average for 39 years being ·85 in. C. TODD, F.R.S.

Sydney.—Rainfall 1·08 in. below, temp. 1°·2 above, and humidity 0·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Early part generally fine, with occasional light rain; middle of month showery; latter part fine. Prevailing N.W. winds at times strong. R. B. GORE.

Auckland.—An exceedingly hot and dry December, the mean temp. being 4°·5 above the average, and the rainfall only one-third of the average.—T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·2 miles. Rainfall of Kingston and the Island generally a little over the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 1·52 in. above the 30 years' average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·32	XI.	Rhayader, Nantgwillt ...	1·73
II.	Dorking, Abinger Hall .	1·57	,,	Lake Vyrnwy	2·20
,,	Birchington, Thor	·71	,,	Corwen, Rhug	...
,,	Hailsham	1·23	,,	Criccieth, Talarvor	1·35
,,	Ryde, Thornbrough	2·02	,,	I. of Man, Douglas	1·51
,,	Emsworth, Redlands ...	1·44	XII.	Stoneykirk, Ardwell Ho.	1·89
,,	Alton, Ashdell	1·51	,,	New Galloway, Glenlee	1·94
III.	Oxford, Magdalen Col..	·92	,,	Moniavie, Maxwelton Ho.	2·72
,,	Banbury, Bloxham	1·36	,,	Lilliesleaf, Riddell	1·45
,,	Northampton, Sedgebrook	·83	XIII.	N. Esk Res. [Penicuick]	1·95
,,	Duddington [Stamford].	1·08	XIV.	Glasgow, Queen's Park..	2·66
,,	Alconbury	1·40	XV.	Inverary, Newtown	4·38
,,	Wisbech, Bank House...	·80	,,	Oban, The Corran	3·64
IV.	Southend	1·00	,,	Islay, Gruinart School...	1·41
,,	Harlow, Sheering..... ...	1·33	XVI.	Dollar.....	1·77
,,	Colchester, Lexden	·82	,,	Balquhidder, Stronvar...	4·47
,,	Rendlesham Hall	·62	,,	Ballinluig	1·46
,,	Rusball Vicarage	·59	,,	Dalnaspidal H.R.S.....	4·23
,,	Swaffham	...	XVII.	Keith H.R.S.....	1·98
V.	Salisbury, Alderbury ...	1·41	,,	Forres H.R.S.	1·04
,,	Bishop's Cannings	1·13	XVIII.	Fearn, Lower Pitkerrie..	1·49
,,	Blandford, Whatcombe .	1·82	,,	N. Uist, Loch Maddy ...	2·06
,,	Ashburton, Holne Vic...	2·23	,,	Invergarry	1·73
,,	Okehampton, Oaklands.	1·74	,,	Aviemore H.R.S.	2·09
,,	Hartland Abbey	1·74	,,	Loch Ness, Drumnadrochit	2·50
,,	Lynmouth, Glenthorne.	1·46	XIX.	Invershin	3·40
,,	Probus, Lamellyn	1·28	,,	Scourie	...
,,	Wellington, The Avenue	1·12	,,	Watten H.R.S.....	1·35
,,	Wincanton.....	1.98	XX.	Dunmanway, Coolkelure	2·63
VI.	Clifton, Pembroke Road	1·65	,,	Cork, Wellesley Terrace	1·40
,,	Ross, The Graig	1·24	,,	Killarney, Woodlawn ...	2·55
,,	Wem, Clive Vicarage ...	·85	,,	Caher, Duneske	1·60
,,	Cheadle, The Heath Ho.	1·51	,,	Ballingarry, Hazelfort...	2·17
,,	Worcester, Diglis Lock	1·03	,,	Limerick, Kilcornan ...	1·24
,,	Coventry, Kingswood ..	1·62	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	1·11	,,	Miltown Malbay	2·12
,,	Horncastle, Bucknall ...	1·22	XXI.	Gorey, Courtown House	1·18
,,	Worksop, Hodsck Priory	·88	,,	Athlone, Twyford	1·39
VIII.	Neston, Hinderton	1·12	,,	Mullingar, Belvedere ...	·81
,,	Southport, Hesketh Park	1·44	,,	Longford, Currygrane...	1·89
,,	Broughton-in-Furness ...	2·94	XXII.	Woodlawn	2·29
IX.	Ripon, Mickley.....	·96	,,	Crossmolina, Enniscoe ..	2·70
,,	Melmerby, Baldersby ...	1·13	,,	Collooney, Markree Obs.	2·51
,,	Scarborough, Observat'y	·88	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·44	XXIII.	Warrenpoint.....	1·12
X.	Haltwhistle, Unthank...	1·67	,,	Seaforde.....	1·56
,,	Bamburgh	1·72	,,	Belfast, Springfield	2·32
,,	Keswick, The Bank.....	2·43	,,	Bushmills, Dundarave..	2·21
XI.	Llanfrechfa Grange	..	,,	Stewartstown	1·92
,,	Llandovery	1·64	,,	Killybegs	3·67
,,	Castle Malgwyn	1·43	,,	Lough Swilly, Carrablagh	2·48
,,	Builth, *Abergwesyn Vic.*	*2·04*			

MAY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date	No. Nights below 32° In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·08	— ·82	·41	30	9	78·0	18	33·9	1	0	
II.		Maidstone (Hunton Court)...	1·21	— ·17	·25	29	9	...	...	...	...	...	
,,		Strathfieldsaye	1·14	...	·30	31	10	...	...	...	...	...	
III.		Hitchin	1·12	— ·83	·32	30	11	69·0	25	31·0	12	3	
,,		Winslow (Addington)	·85	— 1·25	·21	31	11	72·0	25	32·0	4, 12	2	
IV.		Bury St. Edmunds (Westley)	1·26	— ·49	·21	11	10	68·0	30	28·0	13	...	
,,		Norwich (Brundall)	·91	...	·26	11	14	74·0	30	34·6	11	0	
V.		Weymouth(LangtonHerring)	1·42	— ·19	·39	29	11	73·0	18	36·0	13	0	
,,		Torquay (Cary Green)	...	...	...	...	...	...	...	...	...	...	
,,		Polapit Tamar [Launceston]..	1·39	— ·44	·22	29	13	72·3	18	28·4	13	1	
VI.		Stroud (Upfield)	1·52	— ·52	·47	28	11	69·0	21	37·0	3	0	
,,		ChurchStretton(Woolstaston)	1·19	— 1·68	·31	29	14	67·5	24	31·0	11	3	
,,		Tenbury (Orleton)	1·00	— 1·55	·30	29	13	72·0	25	30·0	13	2	
VII.		Leicester (Rotherby Hall) ...	1·02	...	·30	29	10	...	...	...	...	...	
,,		Boston	1·08	— ·64	·55	30	9	75·0	31	31·0	12	1	
,,		Hesley Hall [Tickhill].....	1·13	— ·91	·54	31	13	71·0	21	31·0	12	2	
VIII.		Manchester(PlymouthGrove)	1·85	— ·50	·42	28	13	71·0	22*a*	32·0	11	1	
IX.		Wetherby (Ribston Hall) ..	...	...	...	...	...	...	...	...	...	...	
,,		Skipton (Arncliffe)	3·31	— ·41	·92	28	16	...	...	...	...	...	
,,		Hull (Pearson Park).	1·40	— ·48	·48	29	10	68·0	31	31·0	11	2	
X.		Newcastle (Town Moor)	1·21	— ·54	·38	25	9	...	...	...	...	...	
,,		Borrowdale (Seathwaite).....	5·89	— 2·72	1·27	4	19	...	...	...	...	...	
XI.	WALES.	Cardiff (Ely).....	1·30	— 1·55	·31	29	11	...	...	...	...	...	
,,		Haverfordwest	2·42	+ ·06	·70	27	13	75·3	18	36·0	4	0	
,,		Aberystwith (Gogerddan) ...	2·37	.	·57	27	13	74·0	18	23·0	12	11	
,,		Llandudno.....	1·13	— ·80	·31	28	14	67·5	31	39·8	11	...	
XII.	SCOTLAND.	Cargen [Dumfries]	2·60	+ ·08	·86	28	11	69·0	16*b*	30·4	13	2	
XIII.		Edinburgh (Blacket Place)...	1·28	...	·40	28	14	67·9	31	33·9	13	0	
XIV.		Colmonell	1·40	...	·39	25	12	74·0	19	27·0	12	...	
XV.		Lochgilphead (Kilmory)	3·21	— ·14	·68	4	15	...	...	28·0	12	2	
,,		Mull (Quinish)	3·95	+ 1·00	·59	28	18	...	...	...	...	...	
XVI.		Loch Leven Sluices	1·80	— ·76	·50	29	9	...	...	...	...	...	
,,		Dundee (Eastern Necropolis)	1.35	— ·31	·50	28	14	65·8	30	32·0	7, 20	2	
XVII.		Braemar	2·30	— ·11	·52	4	14	64·0	20*c*	29·0	27	6	
,,		Aberdeen (Cranford)	2·39	...	·85	28	17	62·0	31	30·0	3	2	
,,		Cawdor (Budgate)	1·59	— ·16	·38	26	14	...	...	...	...	...	
XVIII		Strathconan [Beauly]	4·19	+ 1·10	·80	5	12	...	...	...	...	...	
,,		Glencarron Lodge.....	5·71	...	·82	4	19	68·0	21	30·5	13	4	
XIX.		Dunrobin	2·55	+ ·45	·49	30	17	59·0	5*g*	...	...	...	
,,		S. Ronaldsay (Roeberry).....	1·57	— ·15	·26	28	17	63·0	16	32·0	10	1	
XX.	IRELAND.	Darrynane Abbey.....	2·12	...	·36	26	16	...	...	...	...	...	
,,		Waterford (Brook Lodge) ...	...	...	...	...	..	...	...	...	...	...	
,,		O'Briensbridge (Ross)	2·32	...	·49	6	15	...	...	...	...	...	
XXI.		Carlow (Browne's Hill)	1·62	— ·72	·34	6	12	...	...	...	...	...	
,,		Dublin (FitzWilliam Square)	1·14	— ·79	·27	6	14	63·6	16	36·2	6	0	
XXII.		Ballinasloe	1.50	— 1·19	·25	6	15	68·0	21*d*	36·0	11*f*	0	
,,		Clifden (Kylemore)	5·03	...	·82	30	17	...	...	...	...	...	
XXIII		Waringstown	2·47	+ ·03	·36	26	16	74·0	16*e*	32·0	3*f*	2	
,,		Londonderry (Creggan Res.).	2·86	+ ·34	·73	28	19	...	...	...	...	...	
,,		Omagh (Edenfel)	..	...	...	...	...	...	...	...	...	...	

+*Shows that the* fall was above the average ; —that it was below it.

a—and 23. *b*—and 22. *c*—and 21. *d*—and 22, 23. *e*—and 17, 21, 22, 24. *f*—and 13. *g*—and 6,

METEOROLOGICAL NOTES ON MAY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

ADDINGTON.—The third May in succession with a small rainfall, very little falling until after the 25th. The low night temp. kept vegetation much in check, but there was no frost severe enough to destroy anything. One peal of T was heard on the 25th, at 2.50 p.m., and T with R on the 26th. Shower of H in the neighbourhood on the 28th.

BURY ST. EDMUNDS, WESTLEY.—A cold month, with harsh N.E. winds and sharp frost on 13th; very unfavourable for vegetation. H on 6th and 11th. TSS on 25th and 30th. Distant T on 11th and 28th.

NORWICH, BRUNDALL.—A cold and changeable month, the second week being particularly unseasonable, with S on the 12th and H on the 11th, 12th, and 13th. T on the 25th and 30th, and L on the 30th and 31st.

WEYMOUTH, LANGTON HERRING.—For the first fifteen days of the month the weather was cold and dry, and up to the 24th only ·33 in. of R fell, but 1·09 in. in the last week refreshed the fields and gardens, which were parched by a long continuance of N.E. winds. The mean temp. at 9 a.m. (52°·7) is 1°·4 below the average of 25 years. Solar halo on the 17th. TS on the 19th. For the first five months of the year the rainfall is 47 per cent. above the average.

POLAPIT TAMAR [LAUNCESTON].—A rather unseasonable month on the whole; very dry during the day for the first three weeks, but cold at night. Easterly winds prevailed during the greater part of the month. A sharp frost on the morning of the 13th did considerable damage to vegetation.

STROUD, UPFIELD—Snowstorm about 6 a.m. on 11th.

WOOLSTASTON.—A very cold and dry month. Violent storm of H on 11th, followed by S. Mean temp. 50°·6.

TENBURY, ORLETON.—A very dry month, with temp. slightly below the average. The first part of the month was very cold, with frequent frosts, which did much damage to the fruit. A very large proportion of cold N. and N.E. wind.

SKIPTON, ARNCLIFFE.—A rather dry month, with cold N. and N.E. winds.

HULL, PEARSON PARK.—H on 6th, 26th, and 28th; TS on 29th, and T on 6th, 28th, 30th, and 31st.

WALES.

HAVERFORDWEST.—The first week was in pleasant sequence with the last month; a drought then set in, with strong easterly and north-easterly breezes amounting at times to the force of half a gale. The dryness of the air was remarkable, particularly so as evidenced by the readings of the wet and dry bulb from the 17th to the 24th; on the 17th the 9 a.m. readings of the hygrometer differed 13°·2, and on the other days varied from 8° to 10°; large ponds of water evaporated like magic, and had not the much-prayed-for R come, the hay and other crops would again have proved a disastrous failure. H storm on 30th, at 3.30 a.m., ·35 in. fell in 15 minutes.

ABERYSTWITH, GOGERDDAN.—Bright sunshine, with drying E. wind, from the 14th to 24th. Springs very low, but nice rains in the last few days.

SCOTLAND.

CARGEN [DUMFRIES].—Although the temp. was very appreciably lower and the R much greater than in May of 1895 and 1896, the figures representing the meteorological conditions of the past month are chiefly remarkable as showing how very closely they correspond with the averages for May in the last 38 years. The unpleasant weather experienced in April continued during the earlier portion of May; from the 1st to the 13th the mean temp. was 45°·1, and sleet and H showers were of frequent occurrence. A welcome change took place about the middle of the month, but the effects of the higher temp (51°·9 14th to 31st) were marred by a constant succession of parching easterly winds, pastures and corn crops making little progress. A change of wind and nearly two inches of R during the last week effected marked improvement. Farm work is well advanced, but the R, it is feared, arrived too late to ensure a heavy hay crop, and pastures have seldom been barer at the close of May. The oak was just bursting into leaf at the close (this year behind the ash), and the hawthorne commencing to flower, being, with flowering shrubs generally, fully three weeks later than in the past two years. H on 4th. T in afternoon of 27th.

EDINBURGH, BLACKET PLACE.—H on 10th and 11th. Fogs on 20th, 27th, and 28th. Gale on 4th; and rainbow at 6.30 p.m. on 4th.

COLMONELL.—Rainfall 1·05 in. below, and mean temp. 0°·9 below, the averages of 21 years. T on 27th.

BRAEMAR.—Another cold and backward month.

ABERDEEN, CRANFORD.—The month was cold, with high winds and little sunshine.

CAWDOR, BUDGATE.—S and H on 6th; H also on 5th, 10th and 11th.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet and very cold, the last half warmer. Mean temp. 48°·9, 1° above the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A showery month, with a week of very fine, hot weather in the middle.

O'BRIENSBRIDGE, ROSS.—Wintry and cold up to the 11th, followed by brilliant sunny days until the 24th, and closing with another change to R and cold.

DUBLIN.—A cold, rather dry month, very showery at the beginning and close, fine and bright in the intervening period, with absolute drought from 12th to 24th inclusive. The prevailing winds were from polar quarters, N.W., N.E., and E. Mean temp. 50°·9, or 1°·1 below the average. Solar halo on the 24th. High winds on 12 days, attaining the force of a gale from W.S.W. on the 4th; slight fog on 20th. H on 5 days.

BALLINASLOE.—L and T at 1.45 p.m. on 29th.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to him at 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

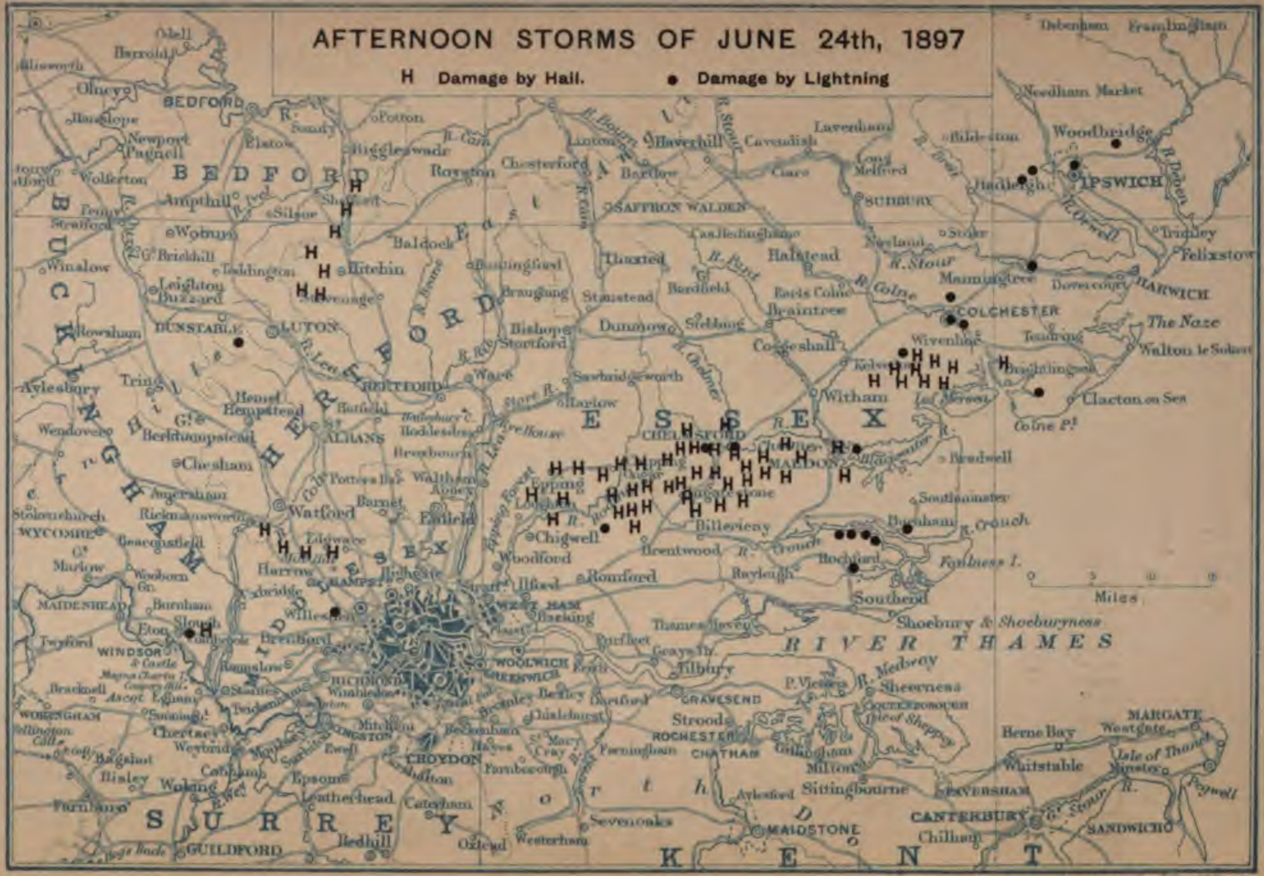
Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young*, in "*Ten Years' progress in Astronomy.*"

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

THE NEW YORK
PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.



AFTERNOON STORMS OF JUNE 24th, 1897

H Damage by Hail. • Damage by Lightning

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVIII.] JULY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

THE STORMS OF JUNE 24TH.

IT may be noticed that this title is very vague—many occurred to us, but there were objections to all—"The Essex Hailstorm" would not do for two reasons, (i.) it would not include the disasters near Luton, Bedfordshire, and (ii.) the damage was not due to hail alone, —true, there was an enormous, an unusual, amount of H, and some of it was extremely large; but the mischief arose from the great strength of the wind, which gave to the H the penetrative energy, which its mere fall by gravity would not have done.

We repudiated the title of "Whirlwind" because we cannot trace any facts which indicate horizontal vortex motion, or the expansion of confined air. The facts would probably fit in with the theory of a revolving storm of which the axis was horizontal. We have tracked H storms which seemed to support such an idea—say that of a monster steam roller passing along, but sometimes resting on the surface, and at intervals lifted above it, so that little injury was done. We objected to the title "Afternoon storm," because all was not quiet till about 8 p.m.

We have had some experience of heavy hailstorms, so that they are not quite such novelties to us as they seem to be to many persons. We can just recollect the London storm of August 1st, 1846, when skylights went, and between three and four inches of rain came through; then in the *Met. Mag.*, Vol. xiv. pp. 97 and 125, will be found details of the severe one at Richmond, Surrey, August 2nd and 3rd, 1879, with one stone $4\frac{1}{2}$ inches long; but before that (we forget the date) we went to Winchmore Hill to see the wreck of one there, and remember three facts—casement windows with the lead knocked out as well as the glass—giant rhubarb stems cut right across—and a poor pony (which had been without shelter in a field) its back all lumps from the pelting which it had suffered—and there are many other cases in our previous volumes.

But we do not remember two instances within a month, of hailstones as large as hen's eggs falling in England, as seems to have been the fact both at Seaford, Sussex, in May, and at Ingatestone, Essex, in June.

At the end of this article we give some very condensed statements as to facts. We hope that this earlier portion is equally trustworthy, but, in order to economize space and to make it easily understood, we have arranged it as a kind of narrative.

The special feature of the early part of June 24th was its high temperature—approaching 90° in the shade. If any one should write a complete memoir of the events of this day, one point to study would be the automatic records of temperature, in order to ascertain the precise time of the sudden fall in temperature, so as to find out whether it was a cause, or a consequence, of the storms.

The earliest record of any disturbance was a shower at Twyford (Berks.), at noon. About an hour later there was a sharp TS, with very large H, at Slough (Bucks.). At 1.30 p.m. large H, L, T, and R were occurring round Uxbridge, Harrow, Stanmore and Pinner. At 1.55 the wind carried away some garden frames at Willesden; at 2.6 the captive balloon from the Royal Botanic Gardens; at 2.45 it carried away a tent a little south of Epping, Essex; at 2.55 it was wrecking Ingatestone; it reached Chelmsford at 3; Danbury at 3.10, and died out south of Colchester before 4 p.m. But this was not all—whether connected with this disturbance, or not, we do not know, probably not,—there was wreckage going on nearly at the same time (about 3.30 p.m.) along a strip of Bedfordshire, between Luton and Biggleswade, being specially bad in the parishes of Henlow and Lilley.

Later in the day, in North Surrey, Hampshire, and other adjoining counties, and along the East Coast, as far as Hull, there were TSS, with short heavy rains.

We should need an entire number to give details of the damage, so we do not make the attempt. Most persons have seen the accounts in the newspapers, and have learned from the statement in the House of Commons by the Minister for Agriculture (The Rt. Hon. W. H. Long, M.P.) that by personally driving through the Chelmsford and Ingatestone district he had been convinced that there was no exaggeration whatever.

His statement is conclusive and needs no support; but we should like to mention that we have been favoured by one of our correspondents with some beautiful photographs (by Duyshart & Co., of Chelmsford) of the damage, and they seem to us to demonstrate beyond dispute our conclusion that wind was as serious a destructive agent as the hail, and that the unusual ruin was the result of their joint action.

One great source of trouble is, that Essex has not had a bad hailstorm for some years, and therefore many of the farmers and nurserymen had given up insuring against injury by hail, and now of course are in dire distress. Not all, however, for we have heard of one man having already had from his Insurance Company a cheque for something over £880. Had all his brethren been equally careful, June 24th would have been a bad day for the companies.

We are aware that this article is not so strictly systematic as we usually try to make our notes, but there have been two great difficulties in the way—(*a*) the enormous amount of information to be epitomized; (*b*) the fact that if all the entries were grouped either chronologically or geographically, the special features as to wind, H and L could not have been brought out. We have, therefore, adopted the following grouping:—*Selections from Correspondence*, arranged nearly in chronological order, and so giving a history of the storms; *Animals and Poultry killed; Damage by Lightning; Hail; Wind.* In these sections the entries are arranged alphabetically, and most of them refer to Essex; but that the damage in Bedfordshire was nearly as serious (though over a smaller area) may as well be proved by a specimen extract:—

Langford.—A terrific storm passed over this village on Thursday week at about four o'clock in the afternoon. The lightning and thunder were not particularly severe, but the wind and hail were most alarming, and have caused sad havoc and loss. Such a storm has not visited this village since 1843. The crops have suffered terribly, wheat and barley being broken about half-way down the straw, and have already started to prematurely ripen. Onions have scarcely a particle of luke left on them, and turnip seed and beans are ruined. Many gardens are wrecked, the vegetables being badly cut, and the fruit stripped from the trees or so badly bruised that it will be of no service. In many cases the bark of the tree is so badly bruised and cut that in all probability the trees will die. A quantity of glass was broken, and a number of young fowls and ducks were killed. Numbers of dead rooks were collected from the fields next day. The hailstones were of enormous size and very irregular in shape, many resembling rough pieces of ice with sharp edges.

Two other subjects have to be mentioned:—First, our sympathy with the sufferers. By all accounts the Essex farmers have been having hard times. The harvest of 1897 promised to make amends. Over about 100 square miles (one-fifteenth of the county) this prospect has been swept away. Granting that over only half that area is there a total loss, it still means 32,000 acres, and putting it even at £3 an acre, it means a loss of about £100,000. We have seen the amount put at more than double that sum, but it will be hard enough to raise even the £100,000 at which we have put it. The Mansion House fund will need all the help it can get.

The other subject not mentioned is the map, on which, though the scale (in order to include the whole path) is necessarily small, the sites of damage are represented with precision, as far as information has reached us. The spaces without damage between Edgware and Epping, and again S.E. of Witham, are, we believe, strictly true.

SELECTIONS FROM CORRESPONDENCE.

Twyford, Haines Hill.—Heavy shower about noon, but it gave only 0·09 in. In the afternoon (about 4.30 to 6 p.m.) a TS brought the total for the day to 0·59 in.—S. M. WEDDERBURN.

Slough, Upton.—Violent TS at 1.15 p.m., several buildings struck and two cottages burned down. Very large H. Total R 1·31 in.
R. BENTLEY, F.R.Met.Soc.

Slough, Upton Park.—The R measured here at 2.15 p.m. was ·20 in.; by 5 p.m. there had been a further fall of ·73 in., and by 6.50 another ·47, total therefore 1·40 in.—HUGH M. BAKER.

Southall.—A little west of this place I found a large elm had been uprooted, and I was told that much large H had fallen.
K. I. MARKS, F.R.Met.Soc.

Uxbridge, Harefield Park.—Very heavy TS in afternoon; the H was not large, but over an inch of R fell in less than 30 minutes; total R 1·70 in.—W. BATCHELOR.

Stanmore, Wealdstone.—A violent TS with H, of which single stones weighed more than an ounce, began about 1.30 p.m., and lasted about an hour, but R continued till 7 p.m. Total 2·30 in. Vegetables much cut in the gardens, and many rooks stated to have been picked up dead. According to reports, the storm was most severe at Wealdstone, severe at Rickmansworth and Stanmore, and slight at Pinner.—G. E. ELAND.

Harrow Weald, Hill House.—Heavy TS with H the size of hazel nuts between 1.30 and 3 p.m. The R in those 1½ hours was 1·84 in., and the total 1.30 to 7 p.m., 2·08 in.—A. CROSSMAN.

Ealing.—About 2 p.m. [1.50 p.m. we believe.—ED.] a storm swept through Ealing, raising clouds of dust of extraordinary volume and density, and doing considerable damage to Jubilee decorations. Two hours later a TS broke with torrents of R. At the Local Board offices the fall in one hour was 1·40 in., and at Perivale 1·78 in.
C. JONES, C.E.

Willesden Green.—At 1.55 p.m. a sudden squall lifted two glass frames, used as roof to a shed, and carried them away as if they had been sheets of paper. Total R 0·34 in.—R. LAMPORT.

Kensworth [Dunstable].—Terrific TS, a tree and a cottage struck; no H, and only 0·05 in. of R.—S. GRACE JONES.

Broxbourne.—T, H and R, total 0·61 in.—G. J. NEWBERY.

West Kensington, Edith Road.—At about 1.30 p.m. we had a sudden dry squall, and my thermograph showed a fall of 15°. About 5 p.m. we had a TS, and at 5h. 14m. 30s. I saw what looked like a large ball of pink fire, burst like a shell upon a house opposite, knocking off part of the gable, dislodging part of the roof and breaking the window.—G. VON U. SEARLE.

Finchley, Etchingham Park.—Frequent T (but not much L) 1 to 7 p.m. Very heavy R, with H rather larger than hazel nuts, 2.5 to 2.20 p.m. Total R 0·65 in.—J. W. SCOTT.

Muswell Hill.—T for some hours in afternoon. Total R 0·32 in.
S. G. ABETHELL.

Camden Square.—Hot in morning, 87°·8 in the shade. At 2h. 0m. 36s. p.m. a sudden strong gust of wind and sudden fall of temperature of 10°, calmer till 2.5, then very rough until 2h. 9m.

No R, L nor T, but in N.W. and N. a thick darkness covering everything. About 3 p.m. T, and thence till 6.16 p.m. L, T and R, but in no wise exceptional. Total R 0·26 in., most of which fell between 5 and 5.45 p.m.—G. J. SYMONS.

Ongar, Abbots Roding Rectory.—Total R 0·75 in.—L. CAPEL CURE.

Chelmsford, Writtle.—We have had a terrific storm here—H, R, L, T and wind. At 11 a.m. the shade temperature was 83°, and the air very oppressive; the storm so cooled the air that at 7.30 p.m. it was only 60°. At 3.3 p.m. there occurred such a storm of wind and H as I had never seen. During the storm we could do nothing but listen to the H smashing the windows, and it and the R pouring into the house. The worst of the storm was soon over, but the R continued till nearly 4 p.m., when I measured 1·42 in. At 4·10 p.m. I collected some of the stones, and measured them; the largest I saw were 1½ inches by 1 inch by ¾ in., and they did not melt till 6 p.m.

M. USBORNE.

Chelmsford, Melbourne.—In about 25 minutes during the R and H storm we registered 1·08 in. As the H would not be caught by the funnel of the gauge, I am unable to give total amount. The storm began soon after 3.0 p.m., and came from S.W. Before it reached us, it became very dark, and we could hear the roar of the storm as it approached; then a few hailstones about the size of marbles; then the storm was upon us, with L, and in half-an-hour it was all over, but as we were in the track, windows and crops were almost totally destroyed. The larger hailstones were 2 in. long by 1½ to 1¾ in. wide and ½-in. thick.—EDWARD ROSLING.

Wickford, Runwell Hall.—A little R and some H fell here about 3 p.m., but it amounted only to 0·03 in., so that the storm cannot be said to have reached here, in fact, the damaged trees along the road hence to Colchester show that the limit was about 4 miles N., in which direction, and notably over Ingatestone, it was very dark.

HENRY KEMBLE, LT.-COL.

Chelmsford, Spergula.—Total R in 15 minutes, 1·14 in.

J. C. THRESH, M.D., F.R.Met.Soc.

Chelmsford, High Street.—Terrific hailstorm, which came up like an advancing wall of ice. R 1·37 in. in 20 minutes. F. CHANCELLOR.

Braintree, Fennes.—We were about 15 miles N. of the zone of greatest intensity. Distant T at intervals from about 11 a.m. 2–3 p.m., T remarkably continuous and gradually louder. 3 p.m., T and L sharp, when nearest about 1 mile distant. R, a smart shower, no hail, ·09 in. Damage, none.

HENRY S. TABOR, F.R.Met.Soc.

Danbury Rectory, Chelmsford.—At 3 p.m. the storm was travelling from the due West to this hill, accompanied by unusual darkness, vivid forked lightning and a rushing wind, that came along in swirls and eddies rather than in one direct blast. At 3.4 p.m. rain began to fall; at 3.10 p.m. the wind was blowing a hurricane, and huge hailstones were hurled upon us; at 3.15 p.m. (about) the worst was

over; at 3.30 p.m. the storm had passed. My rain gauge measured ·83 during the 26 minutes. I should like to observe that there were no hailstones in the funnel of the gauge when I examined it at 3.30 p.m., though the ground all round was strewn with them. (Diameter of gauge is 5 inches, height from ground 1 ft.) Owing to the velocity of the wind, the hail fell at an unusually acute angle, but why none were in the gauge I do not know. I weighed one of the hailstones, which was an average one of the larger sized ones, and it scaled ½ oz. Almost every pane of glass on the west side of the house was shivered, including a large sheet of plate glass.—J. BRIDGES PLUMPTRE.

Writtle, Little Boyton Hall.—The rainfall here was 1·34 in. We were about 500 yards out of the main hailstorm, and did not get any wind, but a few very large stones and very heavy rain; the 1·34 in. fell in 30 minutes (timed). The lightning was overhead, 10 seconds time between flash and report approximately, but during height of storm the lightning and thunder were absolutely continuous, a fact which those in the middle of the storm could not notice. The R at Writtle was 1·99 in. R. W. CHRISTY.

Hatfield Peverel, Cardfields.—I am very happy to say that Cardfields was only on the outskirts of the storm, though Fairfields (another house on my farm) had 54 windows broken out of a possible 76. The storm was preceded by a dense black cloud, travelling from N.W. to S.E., making it too dark to read, and the hail and rain began at 3.5, and at 3.25 the storm was over and the sun shining brightly, and in the 20 minutes I registered ·92 in. Some of the hailstones which fell at Fairfields were slabs of ice larger than the palm of your hand, and Mr. Edward Corder, of Writtle, told me that he measured one 4½ inches by 3½ inches which weighed 5 ozs. The centre of the storm was apparently Writtle, Blackmore, and that neighbourhood, where the crops are almost entirely destroyed.

ALF. ROSLING.

Maldon.—The storm was not at its worst here. The hailstones were all rounded at the edges, and I think did not exceed half-an-inch in diameter. Hence, we had no broken windows, nor even frame or pit lights, nor was my garden much injured. R 1·12 in., the greater part of which fell in an hour. We are 10 miles from Chelmsford, where thousands of panes of glass were broken, and at Widford and Ingatestone, 5 to 8 miles nearer London, they caught the utmost severity of the visitation. At Chelmsford I saw drawings of some hailstones, taken by Mr. Charles Pertwee, architect, which measured nine-eighths of an inch across and five-eighths in thickness. These specimens had all the appearance of pieces of broken ice, having jagged edges. The L and T were extremely severe, being almost continuous throughout the hour that the storm lasted.

THOS. ISAAC.

Colchester, Lexden.—Very severe TS, but no H. Total R 0·92 in.

S. F. HURNARD.

Ipswich, Bishop's Hill.—Unusually severe TS, but not much H or R.
G. A. BIDDELL, C.E.

Bury St. Edmunds, Westley.—Very heavy TSS; total R 0·97 in., but the storms were very partial, villages within two miles having little or no rain.—R. BURRELL.

Norwich, Brundall.—Much damage by L during a series of TSS, 3 to 6 p.m. R here only 0·07 in.
ARTHUR W. PRESTON, F.R.Met.Soc.

East Molesey, Palace Road.—R in two hours, 4.30 to 6.30 p.m., 1·55 in.—M. S. JENKYNS.

Surbiton, Vronvelin, Lovelace Road.—Between 4.45 and 6.30 p.m. R 1·96 in.—F. J. BARCLAY.

North Surrey.—The following heavy rains occurred on the 24th:—

New Malden (Sewage Works)	1·82 in.
Esher (,, ,,)	2·32 ,,
West Molesey (Chelsea Water Works)	1·96 ,,
Surbiton (,, ,, ,,)	2·12 ,,

F. CAMPBELL BAYARD, LL.M., F.R.Met.Soc.

Pirbright Camp.—A TS with H and R, 5 p.m. to 5.30 p.m.; R 0·93 in.—H. ELWICK.

Marlow.—Sudden squall of violent wind, L, T, H and R, about 6.8 to 6.15 p.m.—W. R. GOWERS, M.D., F.R.S.

Alton, Colmer Rectory.—No storm near here till about 6.30 p.m., and then only distant. At 8.5 p.m. another short and sharp, but neither H nor R remarkable.—T. HERVEY.

Alresford, Swarraton Rectory.—TS with H began in E. at 7 p.m., and worked round by N. to N.W., and by 7.50 p.m. 1·42 in. of R had fallen.—W. L. W. EYRE, F.R.Met.Soc.

ANIMALS AND POULTRY KILLED.

Essex.—The number of birds killed was enormous, and in many districts there will be no shooting. Not only were young birds drowned, but old ones were struck dead by the hailstones. Cases are on record where wood-pigeons, crows, and other birds fell from trees as if shot by guns, with their heads split open by the falling ice.

Galleywood.—Galley Hall, only a few chickens killed.

Little Baddow and District.—Mr. Charles Smoothy, of Old Riffhams Farm, Little Baddow, reports as under:—"I am sorry to say that the storm here was very destructive to game. We picked up three old partridges, and several young, in a field adjoining my house, killed by the hail, evidently while brooding their young. Some of them were cut as if they had been struck by a bullet. From the severity of the storm, which lasted about half an hour, I am sure no birds could live in the open. This storm has killed hundreds. I am afraid that sportsmen will be greatly disappointed in September. Old birds as well as young must have been killed unless they were well

sheltered by fence or wood. There were over 200 fowls killed in the village of Little Baddow.

Margaretting Hall.—One lamb and several chickens killed.

Mundon.—Some young ducks killed by hail.

Stondon.—Halsford Bridge Farm, 12 chickens killed.

" Woolmongers Farm, 50 chickens killed.

" Paslow Wood Common, 10 young turkeys and many chickens killed.

West Hanningfield.—Many chickens killed.

Widford.—Many pheasants killed.

Wigborough.—Nine chickens killed.

Writtle.—Many chickens drowned, two goslings struck dead by hail.

DAMAGE BY LIGHTNING.

Burnham.—Mr. Read's new workshop was struck but not much damaged.

Colchester.—Chimney struck at the Ordnance Stores.

" Mile End Church, roof and clock damaged.

" Mount Cottage, Butt Road, chimney struck.

Ealing, Hanger Hill.—Oak tree struck.

Ingatestone.—Harding's Farm, chimney struck and fell through roof.

Layer de la Haye.—Oak tree struck.

Manningtree.—Brantham Mill struck, but not ignited.

Rochford.—Market Place. Roof of Mr. Ashby's house struck.

" Eastwood. Several trees struck.

" Mr. Bentall's chimney struck and fell through roof.

St. Osyth Priory.—Tower struck and clock stopped.

Wallasea.—Cottage near the schools much damaged.

HAIL.

Barking.—None.

Blackmore.—When the storm broke it caused two horses to bolt with a mowing machine, which was smashed, another pair ran away with a water-cart, knocked down three other horses, and the whole five fell into a ditch in a heap.

Chelmsford.—The hailstones were of various shapes, some globular, some oval, some oblong, some like sections of cylinders, and some exactly like small saucers, the edges resembling white lace, while the centres consisted of transparent ice, bluish in colour. Mr. Charles Pertwee picked up in the garden of his house, Claremont, London Road, two of the cylindrical shaped hailstones, which he found upon measurement to be five-eighths of an inch thick, and one and one-eighth inches across. It seemed as if rain-drops were congealed on the surfaces of the original stones. Mr. Pertwee had more than 200 squares of glass broken.

Chelmsford.—The corrugated iron shed of Messrs. Hodge and Taylor, near the railway, was so riddled by the hail that it looked as if it had been shot at. About 25 sheets of the iron were pierced.

Danbury.—At the Rectory the hail knocked holes in the water-spouts.

Galleywood.—Flattish stones were picked up here measuring two inches square.

Ingatestone.—Mr. Arthur H. Raven says that he picked up one stone which measured 5½ inches round, and another which weighed (at the Post Office) 3½ ounces.

Ingatestone.—At Lee Farm the hail went through the slate roofing.

Ingatestone.—Mill Green Park, twenty-four hours after the hail-storm the stones lay a foot deep on the N.W. side of the house, and one taken up haphazard measured 4½ inches in circumference.

Ingatestone.—Ingatestone Hall. Mr. Coverdale thus relates his own personal experience of the storm:—"I was driving with my son and my coachman, a man named Gray. We had just got up to Mr. Kortright's house when the storm came on. We jumped out of the trap and hastened into the house. The storm descended without the slightest warning, except the blackness. First the hail and rain came down vertically, and then at a sharp angle. Down came the top of a tree at once. My man Gray—how he stood the storm I don't know—managed to get the cob under the sides of the house, and Mr. Kortright, my son, and I went out to try to assist. The hailstones immediately riddled the umbrella which I put up, and beat me back. The pony sustained a cut right down his nose. (This was a jagged wound about 1½ inches in length, and the pony's whole body was covered with lumps about the size of hen's eggs. A pailful of hailstones was gathered out of the trap). My man's chest and arms looked afterwards just as if he had had five minutes with a bruiser. They were discoloured everywhere, and full of bumps. The force with which he was struck by the hailstones may be estimated by the fact that although he was wearing a mackintosh, livery coat, sleeved waistcoat, and shirt, he is black and blue. His tall hat was dented in. My son got a crack on the head through his hat, and there was a bump on his head in a moment as big as a hen's egg."

Ingatestone.—Mill Green. The roof of Mrs. Du Cane's house looked as if some one had gone along and broken the tiles with a hammer.

Kelvedon Common.—Several hailstones were measured by Mr. Brenes, some of them more than 2¼ inches across.

Layer Breton.—Hail as large as walnuts.

Little Baddow.—At Cuckoo's Farm, at 3 p.m., the hailstones were the size of a hen's egg—they smashed a stable window, and so pelted the horse that he nearly went mad; one stone struck a chicken dead at one blow.

Little Baddow.—On Saturday (about 48 hours after they had fallen), Mr. Mecklenburg found in a ditch hailstones which weighed more than half an ounce.

Little Baddow.—Mr. C. Smoothy says that the hail not merely came through his windows, but cut the blinds to shreds. After they

had been lying some time, he measured one 6½ inches in circumference.

Maldon.—A man driving some ladies had on a hard hat, it was cut through in four places by the hail, and the ladies' umbrellas were riddled.

Margaretting.—Mr. Bright reports hailstones 6 inches round.

Margaretting Hall.—Mr. D. Christy said :—"I was on the top of that haystack when the storm broke. The wind blew away the poles and ladders, and there I had to stay! Two trees close to the stack were twisted and blown about to such an extent that I expected them to come down upon the stack every moment. One or two trees were blown down quite close to me, but I did not hear them, owing to the noise of the wind and hail. One of my old men (Cheek), who is of the same age as the Queen, was caught in the storm, and his arms and body were beaten black and blue by the hail. He has been in bed until this morning, unable to get up. Five other men took shelter under a tree, but when they saw a tree on each side of them blown down, they rushed into the open. Two of my horses bolted with a wagon which overturned into a ditch, and we had to take the wagon to pieces before we could get it out again."

Navestock.—Mr. Long measured a hailstone 4½ inches in circumference.

Ongar.—Cattle have been injured by being pelted with the hail, which drove them nearly wild.

Springfield.—A lady was driving her pony cart, the pony was frightened by the hail and bolted (fortunately homewards), the next day the lady found her shoulders and back stiff and sore from the fusillade of hailstones.

Stock.—Mr. Barton was with a cart, the horse, frightened by being hit by the hail, bolted, and the cart was upset, neither horse nor man was hurt by that, but afterwards a hailstone struck Mr. Barton on his felt hat, and through it, raised a large bump. Some of the stones were as large as hen's eggs.

Theydon Bois.—A hailstone was picked up at Birch Hall which measured 3 inches by 1½ inches.

Writtle.—A hailstone cut through a man's hat and inflicted such a gash that it had to be sewn up.

Writtle.—Skeggs Farm. Mr. Milbank says that he was out in the storm, his straw hat was cut to pieces, his arms, back, and head covered with bruises; four days after the storm there were bruises black and green 3 inches square.

WIND.

Abridge.—Storm lasted from 2.45 to 3.30 p.m.; heavy rain; tent blown down.

Blackmore.—At Spriggs' Farm 30 trees were blown down, one was 4½ feet in diameter. A barn 60 feet long was blown down.

Braintree.—No wind.

Great Baddow.—Six elms blown down—four in one group. On

Great Sir Hughes Farm the top was taken off a tree and dropped on a cottage roof, which it broke in.

Ingatestone.—At Harding's Farm 20 large trees uprooted and many others had tops off.

Ingatestone—In Hyde Park about 20 large trees uprooted and 150 broken.

Ingatestone.—Nearly every private house was damaged, not merely the windows but the roofs, and by overthrown trees. At Mill Green a large frame covered with tiffany was whirled over a clump of trees 30 feet high and carried 60 yards.

Ingatestone.—At Jordan's Farm about 300 tiles were blown off.

Ingatestone.—Mr. Howell, baker, was driving his cart; it was blown over and he was bruised from head to foot. [Probably partly by the fall and partly by the hail.]

Mill Green.—At Mr. Du Cane's house all three chimneys down, one fell through the roof on to a bed.

Mountmessing.—Trees uprooted and blown in all directions.

Stock.—Chimney pots were blown off, stacks overturned, roofs carried away, and trees torn up.

West Hanningfield.—A wagon had just been loaded with clover hay; seeing the hail, the horses were taken out to put them into shelter; this had hardly been done when the wagon was blown over.

Writtle.—At Skeggs' Farm a wagon with two tons of hay upon it was blown completely over; the windmill was so much damaged that it is of no further use, and will have the sails removed.

METEOROLOGY IN BELGIUM.

THE June number of *Ciel et Terre* contains, under the title of *L'Observatoire au Parlement*, a very interesting survey of the present state of Meteorology; but we do not like it, it is too humble. Meteorology has won an honoured position in almost every civilized country in the world, and certainly not least in Belgium, though as yet there is in that country no separate meteorological office, and M. Lancaster writes as if he were pleading for one. If his countrymen understood the subject there would be no need to plead, the office would be created forthwith. Moreover, we are further puzzled because M. Lancaster quotes two able speeches in Parliament in favour of separating the Astronomical and the Meteorological branches of the National observatory, so as to create a seperate Meteorological department, and says nothing as to any objections being raised thereto. If opposite views were expressed, we think that they should have been set out, and dealt with in the article. But as far as we can see the arguments are unanswerable, and so, perhaps, by this time all is, as it should be, settled, and Belgium has its *Bureau Météorologique.*

THE RECENT AUSTRALIAN AND INDIAN EARTHQUAKES.

By Prof. J. Milne, F.R.S.

The mails which have recently arrived from Australia, bring long accounts of a severe shock which, on May 10th, shattered chimneys, loosened bricks, cracked ceilings and created alarm in South Australia. The vibrations extended eastwards to Victoria and New South Wales, and from the numerous time-observations which were made, it is clear that sufficient material has been collected to determine the centrum from which the shock emanated. From the character of the movement and its effects, as noted in Adelaide, it seems likely that the origin will be found at a distance of 150 or 200 miles to the south of the same, and, therefore, be sub-marine.

The Australian and other colonies require not only seismographs, but the equivalent of the instrument employed in the Isle of Wight; and the reasons they require them are manifold. Had there been instruments of this type in Australia in 1888, when cable communication with the rest of the world was interrupted for a period of 19 days, it would at once have been known that the cause of this interruption was seismic, and not an operation of war, with the result that the calling out of military and naval reserves would, together with other expenses, have been avoided.

Since 1876 the cables connecting Australia and Java have been interrupted at least eighteen times, and on several of these occasions, when two or more cables were broken simultaneously, we know the cause to have been earthquake movements, producing submarine landslides.

The photograms of the unfelt movements throw light upon disturbances often noted in the records of various instruments employed at observatories. They also help us to confirm, extend, correct, and sometimes disprove, ordinary telegraphic information; but their chief value is that they furnish the means of calculating the velocities with which motion is propagated along different paths *through* our earth, which factors throw new light upon the effective rigidity of the globe on which we live.

The Indian earthquake, which recently wrought much havoc in Assam, announced itself in the Isle of Wight before half-past eleven on the morning of Saturday, June 12th. The movement continued for several hours, and the seismogram is the largest I have yet obtained. A record of this disturbance might have been obtained anywhere on the surface of the globe.

In Greenwich mean civil time, the commencement of movement was in the Isle of Wight at 11h. 29m. 10s.; at Edinburgh at 11h. 18m. 0s.; at Strasburg at 11h. 18m. 32s., and at Grenoble at 11h. 28m. 0s. I should estimate the apparent rate at which the preliminary vibrations were transmitted from Assam to Western

Europe, at 7 to 8 km. per second, or that they took *about* 16 minutes on this journey. If this is the case, the primary shock took place in Assam, in Greenwich time, at 11h. 2m. 0s., or 11h. 12m. 0s. a.m. The origin of this disturbance was in the Cherra Hills, about 240 miles N.E. from Calcutta, or on the convexity of the orogenic fold which runs from Burma, in the south, to Eastern Assam, in the north. The great earthquake of 1869 originated in the same region.

Shade Hill House, Newport, I. of Wight.

WINTERS IN BERWICKSHIRE.

[We have recently been favoured by Mr. W. Hewat Craw, of West Foulden, Berwickshire, with the following table. It seems to us not merely interesting in itself, but suggestive of a guide to winter severity, which would be very useful if adopted generally, and which may even be found so for years when the thermometric records were untrustworthy or non-existent.—Ed.]

Note of the time when the Hill stock (black-faced sheep) required to be fed with hay during snowstorms on the farm of Rawburn, Berwickshire, 1883–1897 :—

Winter.	No. of days when haying was needed.	Days between which sheep required hay.
1883—84	—	No hay required; snow did not lie so deep as to prevent the sheep feeding.
1884—85	16	From 10th to 26th January.
1885—86	34	From 25th Jan. to 11th Feb., and from 2nd to 19th March.
1886—87	19	From 10th to 18th January, and from 14th to 25th March.
1887—88	28	From 21st Feb. to 21st March.
1888—89	5	From 1st to 5th March; one hirsel only.
1889—90	—	No hay required; a mild, open winter.
1890—91	10	From 17th to 27th March.
1891—92	—	No hay required.
1892—93	4	From 27th February to 3rd March.
1893—94	—	No deep snowstorms, but changeable, with severe frosts.
1894—95	54	From 10th January to 5th March. Severe winter, with deep snow.
1895—96	—	No hay feeding needed from deep snow.
1896—97	24	In December, 10 days, from 11th to 21st. In Jan. and Feb, 14 days, from Jan. 21st to Feb. 4th.

ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session was held at the Rooms of the Royal Astronomical Society, Burlington House, on Wednesday afternoon, June 16th, Mr. E. Mawley, F.R.H.S., President, in the chair.

A paper by Mr. R. C. Mossman, F.R.S.E., on "The Non-Instrumental Meteorology of London, 1713–1896," was read by the Secretary. The data were obtained from :—

I. Register kept at Richmond, Surrey, from April 1713 to June 1745, by Mr. George Smith, a Proctor to Queen Anne.*

II. A daily record given in *The London Magazine* from 1747 to 1758.

III. Register printed monthly in the *Gentleman's Magazine*, 1763–1771. The station from November to April was near the north bank of the Thames, just below London Bridge. During the other half of the year, it was situated seven miles west of Hyde Park Corner.

IV. Registers kept by Mr. Thomas Hoy at Kensington, 1771–1774; Muswell Hill, 1775–1782 ; and Sion House, near Kew, 1783–1822.

V. Register kept at Greenwich by Mr. J. H. Belville from March 1st, 1811, to July 7th, 1856.

VI. Daily weather notes from Greenwich Observatory, published in the Registrar-General's *Weekly Return of Births, Marriages, and Deaths*, 1855–1896.

The phenomena tabulated were Thunderstorms, Lightning without Thunder, Mist and Fog, Snow, Hail, Gales and High Winds.

The thunderstorms show an average number of 10 per annum. The maximum was 25 in 1878 and 1880, and the minimum 1 in 1729. The maximum in one month was 12 in June 1726. The annual period is well marked, embracing the six months April to September, during which time 91·5 per cent. of the whole took place. The maximum occurring in July, and the minimum in February.

The total number of fogs was 4,076, an average of 24 per annum. They increase rapidly during September, but the maximum is not clearly defined, the values for October, November and December being practically the same. The minimum is reached in June.

The total number of days with snow was 2,267, an average of 14 per annum.

The snowiest winter was that of 1887–88 with 43 days, while in the winter of 1862–63 there is not a single instance of a snowfall. The greatest number of falls in one month was 17 in January 1814.

The mean date of first snowfall is November 9th ; the earliest date being September 24th in 1811 ; and the latest April 10th in 1834. The mean date of last snow is March 30th, the extreme dates being January 6th, 1894, and May 27th, 1821.

Hail is essentially a spring phenomenon, reaching a maximum in

* See *Met. Mag.*, Vol. xxxi. p. 161.

March and April. The minimum is in July and August. It is probable that most of the cases in summer are falls of true hail accompanying thunderstorms, whereas in spring in nearly every case the substance precipitated is "graupel" or soft hail. The total number of falls observed was 988, equal to an average of 6 per annum.

Mr. C. Harding gave an account of the hailstorm which occurred in the south-west of London on April 27th, 1897. This accompanied a thunderstorm in which the lightning was very vivid. The hail lasted only about 20 minutes, from 6.30 to 6.50 p.m., and in that short space of time the melted hail and rain amounted to about an inch of water. The ground was quite white with hailstones, which in some places remained unmelted the whole of the next day. Much damage was done to fruit trees and shrubs. The paper was illustrated by a sketch-map, shaded to show the area over which hail was observed; extending over a length of about six miles from New Malden to Tulse Hill, and varying in width from about half-a-mile at the S.W. end, to about a mile-and-a-half at the N.E. end, and including Wimbledon, Tooting, Balham, Streatham and Brixton. The stations recording a precipitation of more than an inch were Streatham 1·62 in. and Clapham Park 1·18 in.

THE FROST—EARTH TEMPERATURES & WATER PIPES.

THIS heading does not seem appropriate to Midsummer, but it is only now that the anomaly to which we called attention in April, 1895, has been explained—very unsatisfactorily.

In the *Meteorological Magazine*, Vol. XXX., p. 39, we gave a table of "Earth temperatures at 1 foot in February, 1895," and we made the following remark:—"In the above table the stations are grouped in the order of their mean temperature [for the month] and some results are remarkable. The coldest station, Lowestoft, 29°·0, is within a short walk of the hottest but one, Somerleyton, 33°·8. We believe that the thermometers at both stations have been verified, but think that reverification is desirable."

To-day, June 30th, 1897, we have received the April number of the *Quarterly Journal* of the Royal Meteorological Society, and on page 96 we find the explanation of the whole matter, in the following report by Mr. Marriott. The italics are ours.

"Lowestoft, September 4 [1896]. On comparing the thermometers it was found that the wet had gone up 0°·2. The 1 foot and 2 feet earth thermometers have long tubes surrounded by wooden or metal cases. I had not previously been able to test these thermometers, but on this occasion, with the assistance of Mr. Miller, I succeeded in doing so. *I found that the* 1 *foot thermometer had slipped down its case about* 3° *and was consequently reading much too low.* The 2 feet thermometer was fully 1° too high."

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1897.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	47·0	10	23·4	18	39·8	31·7	34·0	93	69·0	16·6	2·05	20	7·3
Malta	66·6	9	39·4	31	60·1	49·1	47·2	82	124·3	32·3	1·05	10	5·6
Mauritius	88·0	18	69·6	31	84·9	74·6	71·1	78	135·7	62·2	6·35	17	7·0
Calcutta	87·7	15	49·0	19	79·8	57·5	53·6	61	140·5	41·2	·94	...	1·6
Bombay	88·8	9	61·1	20	81·1	67·1	63·7	69	134·6	51·2	·01	1	2·0
Ceylon, Colombo	92·2	6	68·0	13	89·2	73·9	71·2	76	152·0	65·0	3·81	8	3·1
Melbourne	102·2	7	46·5	17	74·0	56·2	52·7	68	150·8	38·2	5·46	9	6·0
Adelaide	105·1	30	51·7	24	82·4	59·3	51·3	52	162·6	40·5	·66	4	4·6
Sydney	90·3	22	51·6	18	78·2	64·3	58·4	63	154·8	44·2	2·15	13	4·4
Wellington	81·0	12	45·0	1	71·6	57·8	53·0	66	145·0	35·0	8·05	11	4·1
Auckland	...	...	...	...	...	...	...	...	...	...	...	...	..
Jamaica, Kingston	89·5	18	62·0	12	85·7	66·6	62·6	66	...	...	·02	1	2·6
Trinidad	90·0	5*a*	64·0	3*b*	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada	87·8	10	70·0	21	82·2	72·5	72·8	83	155·0	...	6·10	20	3·0
Toronto	51·7	3	—7·2	25	29·7	15·6	21·6	87	62·5	— 9·3	1·92	15	8·0
New Brunswick, Fredericton	55·3	5	—18·0	19	24·2	3·8	13·0	75	...	...	3·45	10	4·8
Manitoba, Winnipeg	38·0	1	—38·4	23	8·5	—12·0	...	...	...	...	·89	9	5·2
British Columbia, Esquimalt	51·3	7	22·2	27	42·6	34·6	37·2	93	...	...	5·95	20	8·2

a—and 11. *b*—and 4, 15

REMARKS.

MALTA.—Adopted mean temp. 53°·8, or 1°·0 above the average. Mean hourly velocity of wind 11·6 miles. Average temp. of sea 59°·0. T8 on 19th. L on four days. Severe hailstorm on the 23rd, at 1.5 a.m. Hailstones of dense ice, reaching in size to that of a hen's egg, fell for several minutes. Much damage was done to skylights and windows of westerly aspect. Three hundred and twenty panes of glass were destroyed in this College in about five minutes. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 1°·2 above, and rainfall ·94 in. below, their respective averages. Mean hourly velocity of wind 8·4 miles, or 2·8 miles below average; prevailing direction E.S.E. and E. by N. T and L on 13th. L on 1st and 16th, and T on 7 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on 6th and 7th; thunderstorms occurred on the 24th. ALFRED E. WACKRILL.

Adelaide.—A remarkably cool month. Mean temp. 3°·6 below the average. Rainfall ·19 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall 1·51 in. below, humidity 9 below, and mean temperature 0°·2 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—On the whole a wet month, with interval of fine warm weather; heavy rain in the middle and at the end of the month, 3·20 in. being recorded on the 15th. Strong N.W. winds prevailed, and gales or high winds on ten days. Earthquake on 14th. R. B. GORE.

TRINIDAD.—Rainfall 1·27 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·84	XI.	Rhayader, Nantgwillt ...	3·10
II.	Dorking, Abinger Hall .	1·66	,,	Lake Vyrnwy	4·29
,,	Birchington, Thor	1·55	,,	Corwen, Rhug	...
,,	Hailsham	2·15	,,	Criccieth, Talarvor	3·18
,,	Ryde, Thornbrough	3·08	,,	I. of Man, Douglas	4·76
,,	Emsworth, Redlands ...	3·06	XII.	Stoneykirk, Ardwell Ho.	4·92
,,	Alton, Ashdell	2·53	,,	New Galloway, Glenlee	4·75
III.	Oxford, Magdalen Col..	2·40	,,	Moniavie, Maxwelton Ho.	4·67
,,	Banbury, Bloxham	2·61	,,	Lilliesleaf, Riddell	3·35
,,	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuick]	4·45
,,	Duddington [Stamford].	2·17	XIV.	Glasgow, Queen's Park..	5·67
,,	Alconbury	1·75	XV.	Inverary, Newtown	6·70
,,	Wisbech, Bank House...	2·03	,,	Oban, The Corran	4·99
IV.	Southend	2·64	,,	Islay, Gruinart School ...	1·67
,,	Harlow, Sheering..... ...	2·53	XVI.	Dollar.....	6·19
,,	Colchester, Lexden	2·62	,,	Balquhidder, Stronvar...	5·74
,,	Rendlesham Hall	2·31	,,	Ballinluig	4·95
,,	Rushall Vicarage	1·92	,,	Dalnaspidal H.R.S.....	5·76
,,	Swaffham	...	XVII.	Keith H.R.S.....	4·99
V.	Salisbury, Alderbury ...	2·93	,,	Forres H.R.S.	2·77
,,	Bishop's Cannings	3·69	XVIII.	Fearn, Lower Pitkerrie..	1·94
,,	Blandford, Whatcombe .	3·96	,,	N. Uist, Loch Maddy ...	1·32
,,	Ashburton, Holne Vic...	3·53	,,	Invergarry.....	2·40
,,	Okehampton, Oaklands.	2·55	,,	Aviemore H.R.S.	3·93
,,	Hartland Abbey	2·36	,,	Loch Ness, Drumnadrochit	3·21
,,	Lynmouth, Glenthorne.	3·10	XIX.	Invershin	1·57
,,	Probus, Lamellyn	1·99	,,	Scourie	...
,,	Wellington, The Avenue	2·35	,,	Watten H.R.S.....	1·02
,,	Wincanton.....	2·78	XX.	Dunmanway, Coolkelur.	5·36
VI.	Clifton, Pembroke Road	3·22	,,	Cork, Wellesley Terrace	3·10
,,	Ross, The Graig	3·20	,,	Killarney, Woodlawn ...	4·31
,,	Wem, Clive Vicarage ...	2·38	,,	Caher, Duneske	4·19
,,	Cheadle, The Heath Ho.	3·13	,,	Ballingarry, Hazelfort...	3·52
,,	Worcester, Diglis Lock	2·78	,,	Limerick, Kilcornan ...	...
,,	Coventry, Kingswood ..	2·93	,,	Broadford, Hurdlestown	4·27
VII.	Grantham, Stainby	2·20	,,	Miltown Malbay	...
,,	Horncastle, Bucknall ...	1·68	XXI.	Gorey, Courtown House	2·67
,,	Worksop, Hodsck Priory	2·76	,,	Athlone, Twyford	4·43
VIII.	Neston, Hinderton	2·58	,,	Mullingar, Belvedere ...	4·08
,,	Southport, Hesketh Park	3·28	,,	Longford, Currygrane...	4·68
,,	Broughton-in-Furness ...	7·58	XXII.	Woodlawn	5·21
IX.	Ripon, Mickley.....	3·02	,,	Crossmolina, Enniscoe ..	3·96
,,	Melmerby, Baldersby ...	3·11	,,	Collooney, Markree Obs.	4·74
,,	Scarborough, Observat'y	2·05	,,	Ballinamore, Lawderdale	6·07
,,	Middleton, Mickleton ...	2·74	XXIII.	Warrenpoint.....	6·00
X.	Haltwhistle, Unthank...	3·79	,,	Seaforde..	5·88
,,	Bamburgh	2·50	,,	Belfast, Springfield	5·99
,,	Keswick, The Bank.....	4·38	,,	Bushmills, Dundarave..	5·68
XI.	Llanfrechfa Grange	3·17	,,	Stewartstown	6·71
,,	Llandovery	2·56	,,	Killybegs	8·36
,,	Castle Malgwyn	2·79	,,	Lough Swilly, Carrablagh	5·10
,,	Builth, Abergwesyn Vic.	3·29			

JUNE, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·87	— ·14	·68	8	11	87·8	24	43·3	10
II.		Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...	...
,,		Strathfieldsaye	2·04	...	·92	8	10	...	...	...	...
III.		Hitchin	2·33	+ ·47	·88	8	13	81·0	23	41·0	18
,,		Winslow (Addington)	2·55	+ ·69	1·01	8	12	84·0	13	40·0	10
IV.		Bury St. Edmunds (Westley)	2·94	+ 1·15	·97	24	11	75·0	23	43·0	19
,,		Norwich (Brundall)	2·23	...	·61	18	14	83·0	24	43·4	19
V.		Weymouth(LangtonHerring)	2·94	+ ·71	·89	8	9	76·0	25	45·0	17
,,		Torquay (Cary Green)	...	...	...	...	...	...	...	...	...
,,		Polapit Tamar [Launceston]..	1·73	— ·48	·44	19	12	78 0	25	41·7	3
VI.		Stroud (Upfield)	2·44	+ ·05	·72	8	12	80·0	23*b*	45·0	18
,,		ChurchStretton(Woolstaston)	2·73	+ ·18	·81	8	13	78·0	13*c*	42·0	17
,,		Tenbury (Orleton)	2·32	— ·30	·66	9	11	83·0	12	42·0	10
VII.		Leicester (Rotherby Hall) ...	2·05	...	·54	8	14	...	...	...	...
,,		Boston	1·92	+ ·03	·38	8	12	88·0	23	42·0	21
,,		Hesley Hall [Tickhill].....	3·03	+ 1·11	1·42	30	16	84·0	13	39·0	10
VIII.		Manchester(PlymouthGrove)	3·62	+ ·97	·72	1	13	85·0	23	39·0	8
IX.		Wetherby (Ribston Hall) ...	3·83	+ 1·94	1·14	6	15	...	...	...	...
,,		Skipton (Arncliffe)	5·38	+ 2·02	·85	19	17	...	...	...	...
,,		Hull (Pearson Park).	1·57	— ·18	·36	19	10	83·0	12*d*	39·0	10
X.		Newcastle (Town Moor)	2·82	+ 1·18	·70	18	13	...	..	...	...
,,		Borrowdale (Seathwaite).....	9·03	+ 2·45	1·90	15	18	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	3·13	+ ·70	·86	8	12	...	...	...	...
,,		Haverfordwest	3·14	+ ·58	·72	17	16	78·2	23	43·5	3
,,		Aberystwith (Gogerddan) ...	2·26	...	·49	16	10	83·0	12	33·0	1,2
,,		Llandudno.....	2·30	+ ·53	·68	17	17	76·2	13	43·4	5
XII.	SCOTLAND.	Cargen [Dumfries]	3·36	+ 1·41	·92	15	12	75·2	5	38·0	19
XIII.		Edinburgh (Blacket Place)...	3·99	...	1·00	13	21	73·4	5	36·0	8
XIV.		Colmonell	5·22	...	1·61	15	21	77·0	13	42·0	8*e*
XV.		Lochgilphead (Kilmory).....	7·51	+ 4·41	1·69	15	20	...	...	36·0	18
,,		Mull (Quinish).....	3·28	— ·01	·82	15	19	...	...	...	...
XVI.		Loch Leven Sluices	4·90	+ 3·15	1·30	16	11	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·10	+ 3·60	1·45	15	19	71·9	2	39·5	19
XVII.		Braemar	4·19	+ 2·20	·75	15	18	74·0	29	37·2	1
,,		Aberdeen (Cranford)	3·80	...	·86	16	16	72·0	28	38·0	6
,,		Cawdor (Budgate)	3·63	+ 2·23	·89	15	17	...	...	...	...
XVIII		Strathconan [Beauly]	2·39	— ·10	·74	16*a*	8	...	...	...	...
,,		Glencarron Lodge.....	3·23	...	·92	22	13	74·7	29	34·8	9
XIX.		Dunrobin	1·54	— ·48	·41	15	9	70·0	12	41·0	7
,,		S. Ronaldsay (Roeberry).....	·56	— 1·20	·10	11	12	68·0	29	38·0	7
XX.	IRELAND.	Darrynane Abbey.....	4·91	...	1·13	19	25	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·79	+ ·72	·83	8	14	74·0	5,30	41·0	19
,,		O'Briensbridge (Ross)	3·62	...	·74	8	14	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·60	+ 1·76	·81	29	15	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·26	+ 1·60	·66	8	20	73·7	22	43·0	19
XXII.		Ballinasloe	5·37	+ 3·07	1·38	23	21	71·0	5	43·0	17
,,		Clifden (Kylemore)	6·77	...	1·32	15	15	...	...	...	...
XXIII		Waringstown	5·11	+ 3·04	·87	15	21	79·0	5	40·0	18
,,		Londonderry (Creggan Res.).	6·15	+ 3·73	1·70	15	20	...	...	...	...
,,		Omagh (Edenfel)	7·41	+ 4·94	1·41	15	21	73·0	5	40·0	18

+Shows that the fall was above the average ; —that it was below it.

a—and 22. *b*—and 24. *c*—and 23. *d*—and 13. *e*—and 16, 24.

METEOROLOGICAL NOTES ON JUNE, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

CAMDEN SQUARE.—In some copies of our last number the second figure of the date of the min. temp. in May had disappeared; it should have been not 1 but 13.

ADDINGTON.—Rainfall above the average of ten years. Great range of max. temp. at times, between the 6th and 8th as much as twenty-five degrees, and between the 24th and 25th twenty-two degrees. T on 1st and 24th.

BURY ST. EDMUNDS, WESTLEY.—A hot month with much growing weather. Vegetation made great progress, and the country looked lovely at the close. Remarkable for the heavy TS of the 24th, which though very severe here was very partial, villages within two miles having little or no rain. Distant T on 6th.

NORWICH, BRUNDALL.—The month entered with fine warm weather. The 7th and 8th were very wet and cold, followed by warm weather. A gale of unusual violence for June occurred on the night of the 18th, and TSS on 18th, 24th and 27th. Much destruction was done in Norwich by the storm of the 24th, both to life and property, and buildings were damaged by L on the evening of the 27th, at Blofield, one mile from this station. The max. temp. on 8th, 50°·6, is the lowest recorded in June since 1886.

WEYMOUTH, LANGTON HERRING.—The mean temp. at 9 a.m. is 0°·8 above the average. The hay crops in this neighbourhood are the heaviest that have been known for many years, and the grain crops promise well. There was a severe TS on the 26th, which lasted for more than seven hours, the flashes of L following each other in quick succession. T also was heard on the 24th and 28th. Very high wind on the 18th. Fog on 27th. The rainfall for the first six months of the year, 18·17 in., is with the exception of 1879, when 20·43 in. fell, the heaviest in that period in 23 years, is 45 per cent. above the average for the first half of the year, and nearly three times that of the corresponding period in 1896.

POLAPIT TAMAR [LAUNCESTON].—Generally a fine, very seasonable month. Distant T very frequent during the last week.

STROUD, UFFIELD—Very heavy R from 11 a.m. to 1 p.m. on 1st, ·54 in. falling in the two hours. TS in evening on 26th; heavy TS at night on 28th, with vivid L.

WOOLSTASTON.—A very variable month with repeated and very abrupt changes from sultry heat to cold stormy weather. T on the 6th. Gale on the 18th. Mean temp. 58°·8.

TENBURY, ORLETON.—A fine warm month, with mean temp. about 2°·5 above the average. T on 6th, 24th and 30th.

ROTHERBY HALL.—Total R for first 6 months 11·24 in., against 7·71 in. in 1896.

WALES.

HAVERFORDWEST.—Fine bright hot weather in the first week, followed by nearly a fortnight of broken weather, which was most acceptable to the country, and contributed to the realization of the splendid hay crops, and to every likelihood of a magnificent harvest. Fine, bright, warm weather, with some heavy falls of R at night, closed this most seasonable June. Distant TS on 13th.

ABERYSTWITH, GOGERDDAN.—Bright sun, with S. or S.W. wind, most of the month.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp. of the month was 1°·5 above the average. The constant and sudden fluctuations of temp. were very remarkable;

200853

on no less than six occasions was there a difference of upwards of 10° in the maximum temp. of succeeding days. The duration of sunshine was greatly below the average. Light winds, mostly easterly, prevailed during the month. Farm crops have hardly ever had a better appearance at this season. Warm weather constantly following R caused luxuriant growth, and corn, hay, and turnip crops promise to be much above the average. T and L on 1st and 29th. T on 2nd and 13th.

EDINBURGH, BLACKET PLACE.—The coldest June since 1888, and the wettest since 1879. The rapid alterations of heat and cold were of frequent occurrence. Fog on six days. TS8 on 13th and 14th. Mean temp. on 20th, only 45°·5. Very heavy R at 10 a.m. on 16th, ·44 in. fell in 16 minutes, and the temp. fell till 2.30 p.m., when it was 43°·4.

COLMONELL.—Rain 2·46 in above, and mean temp 0°·5 above, the average of 21 years.

LOCHGILPHEAD, KILMORY.—The wettest month of June remembered, without reference to records; very low temp. also at times.

BRAEMAR.—A dark and wet, but fine growing month.

ABERDEEN, CRANFORD.—Generally cold and cloudy; gale, with R, on 16th, 17th, and 18th.

S. RONALDSAY, ROEBERRY.—A very dry month. Mean temp. 51°·3, being 0°·9 below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A very wet month, with extremely heavy falls of R for a few hours on 19th and 23rd. On the 19th almost all the fall was between 9 a.m. and 1 p.m., and caused great floods. On 23rd most of the fall was between 9 and 11 a.m. Constant thick mist and fog in the last fortnight.

WATERFORD, BROOK LODGE.—Temperature much below that of last year. Heavy TS on 12th; T and L on 28th. Fog on 27th, 28th, and dense fog on 30th.

O'BRIENSBRIDGE, ROSS.—Remarkable for extreme variations of temp., frequent summer L without T.

DUBLIN.—Although the R and rainy days were in excess of the average, and the amount of cloud was large, June, 1897, must be regarded as a favourable month, conducive to health, and propitious to vegetation. It is remarkable that with a preponderance of easterly and north-westerly winds, the relative humidity was very high, and radiation temperatures by night were not low. There was a cold spell from the 15th to the 20th. Mean temp. 58°·7, or 0°·9 above the average. High winds were noted on seven days, but the force of a gale was attained only on the 16th and 19th. Fogs on seven days. TS on the 12th, and L on 22nd. Solar halos on the 5th and 28th.

BALLINASLOE.—Gales from W. on the night of the 15th and all day on 16th, at night on 17th, and all day on 18th and 19th. L and T and heavy R from 10 to 11.30 p.m. on 22nd and L and T at 8 p.m. on 23rd.

WARINGSTOWN.—The wettest June since observations began in 1861, the next wettest being June, 1879, when 4.54 in. fell.

EDENFEL.—The rainfall (7·41 in.) of the past month has not been equalled in any spring or summer month in 33 years, and during that time has been only twice exceeded in any month of the year, viz., by 7·70 in. in October, 1870, and 7·67 in. in December, 1876. As it came after the turnip sowing and before the hay harvest, but little actual damage has been occasioned, except in the lands adjoining mountain torrents, where in many instances the seeds were washed out of the ground. Vegetation is profuse, but there is quite an ominous paucity of flower on all fruit trees, plants and flowering shrubs. Temperatures have been rather below the average, and everything is nearly a month later than last year. The rainfall of the six months, 23.57 in., is the heaviest yet recorded in that period.

NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIX.] AUGUST, 1897. [PRICE FOURPENCE, *or 5s. per ann. post free.*

FROMONDUS AND HIS NOTES ON THE WEATHER.

A RECENT number of *Ciel et Terre* contains the only modern notice which we remember to have seen of Professor Libert Froidmont, of Louvain.* The article, like nearly all those which appear in our Belgian contemporary, is well worth reading, but there are one or two points upon which the author (Prof. Monchamp) may be glad of a little information, and possibly by drawing attention to the article here, still further particulars may be forthcoming.

Prof. Monchamp regards the record of the weather kept by Froidmont in 1614 and in 1625 as "the earliest kept in Belgium, if not in the world." Has he forgotten "Tyge Brahe's Meteorologiske Dagbog, holdt paa Uraniborg for Aarene 1582—1597"?

Everybody did not secure a copy of Merle's MS., so it may be well to give wider circulation to a specimen month, nearly 300 years earlier than Froidmont:—

Record of the Weather at Driby, Lincolnshire, by the Rev. W. Merle, A.D. 1343.

March 1.—Frost, with little snow, and afterwards light rain.
,, 2.—Slight fog.
,, 3 & 4.—Slight frost, with little hoar-frost.
,, 5.—Light rain, with N.W. wind.
,, 6 & 7.—Very strong S.W. wind.
,, 9.—Very strong S.W. wind, with rain.
,, 13.—Very strong S.E. wind, with rain.
,, 15.—Little hoar-frost, with strong W. wind.
,, 16.—Strong W. wind in the night.
,, 17.—Very strong W. wind, with rain.
,, 19.—Very strong W. wind, with light rain.
,, 20.—Little hoar-frost, with little ice.
,, 21.—Little hoar-frost.

* Libertus Fromondus was Dr. of Theology, and Prof. of Philosophy and Theology in the University of Louvain. He was born on the 3rd (or 6th) of September, 1587, at Hackör on the Maas (Haccourt, near Liège, Belgium), and died at Louvain, near Brussels, October 27th, 1653.

March 25 & 26.—Stormy, that is to say, very strong N.W. wind, with cold and with hail, rain, and snow many times in the day.

,, 27.—Slight hoar-frost, with N.W. wind, before mid-day; after mid-day, serenity without wind, followed by light rain, with light thunder once.

,, 28.—Stormy, with very strong N.W. wind, and with hail, rain and snow very often in the day. At mid-day there was an earthquake, which was so great that, in certain parts of Lyndesay, stones in the chimneys fell down, after shaking in very great agitation, and it lasted long enough for the "Salutatio angelica" to be said distinctly.

,, 29.—Stormy, with hail, snow, frost, rain and N.W. wind.

,, 30.—Severer frost than on the 29th, with snow and wind.

,, 31.—Heavier snowfall than on the 30th, with N.W. wind, and there was a good deal of snow then.

The aforementioned earthquake was not felt at Oxford.

We shall be glad of information as to editions of Froidmont's book. We have the first five of the following six; are there any others?

FROMONDI, LIBERTI. Meteorologicorum libri sex.

			Size of Type.
A	4to.	Ex Officina Plantiniana, Antverpiæ 1627, xii.-438 pp.	7·1in. × 4·3in.
B	sm. 8vo.	Guilielmus Turner, Oxoniæ, 1639, xiv.-527 pp. ...	4·9 ,, × 2·7 ,,
C	4to.	Hieronymi Nempæi, Lovanii 1646, xii.-591 pp. ...	6·9 ,, × 4·3 ,,
D	sm. 8vo.	Ed. Story, Londini, 1656, xiv.-527 pp.	4·9 ,, × 2·6 ,,
E	sm. 8vo.	J. Redmayne, Londini, 1670, viii.-464 pp.	5·4 ,, × 3·2 ,,
F	4to.	... ... Londini, 1670...	

Prof. Monchamp quotes only editions A and C, and a London edition of 1655, of which we can trace no other copy. Is it a mistake? or was D issued in 1655 as well as in 1656? It will be noticed that, besides giving what we believe to be the forms (4to, 8vo, &c.) of each volume, we give the length and breadth of a full page of type—*i. e.*, without head-lines or marginal notes. We have long regarded the 4to, 8vo, &c., as confusing, and are glad to quote the following authority against them :—"At the recent International Congress of Publishers in Paris the inexactness of designating the size of books as 4to, 8vo, and 12mo, was discussed, and a resolution was passed to the effect that publishers' catalogues should give the actual sizes of volumes, in the metric system."—*Science*, July 23rd, 1897.

De La Lande in his *Bibliographie Astronomique* calls edition B 12mo. D is once described as 12mo, but generally as an 8vo, though the dimensions are very small for that, and E is described by one authority as 8vo, and by another as 18mo!

We think that one sentence in Prof. Monchamp's interesting note is incorrect, but as the Editors have passed it, we are almost afraid

to criticize. However, we venture on reprinting it, and putting in italics the statement to which we object.

"Il cite (p. 79) un témoin digne de foi qui, au milieu d'une nuit de l'automne de 1625, a vu une longue traînée lumineuse partir de l'occident, s'élever jusqu'au zénith, et faire pâlir la Lune, qui pourtant brillait alors de tout son éclat. *Il s'agit sans doute ici de la lumière zodiacale.*"

Surely the zodiacal light never shone at midnight brightly enough to dim the light of the moon. Would not the passage of a bright meteor accord better with the statement?

Prof. Monchamp gives a diagram of the winds according to Froidmont, which we commend to the attention of Mr. J. G. Wood, in case he should feel inclined to carry further the interesting consideration of the subject which he gave in Theophrastus.

We agree with Prof. Monchamp in his concluding paragraph, which may be freely paraphrased as follows:—

In finishing my little paper, I would advise those interested in Meteorology to read the whole of Fromondus's book. Meteorology has, of course, made great progress in nearly 300 years, but all the theories and facts are not to be despised; even the errors are useful, they show us the road travelled, and the pits to be avoided, they should render us cautious both as to our theories and our facts, if we wish to be respected when another 300 years have passed.

RECENT STORM RAINS.

IN two consecutive numbers we have had to deal with hail of quite exceptional size, falling during the storms in Sussex and Essex, and now we have some equally remarkable rainfall records.

July 20th.

OXFORD.

St. Giles', Oxford.—TS from 3.45 to 5 p.m. and 1·30 in. of R, 1·14 in. falling by 4.45 p.m.—E. M. TAWNEY.

The fall at *Magdalen College* was 0·83 in., and at the *Radcliffe Observatory* 1·66 in.

DEVON.

Water Works, Torquay.—On July 20th we had a very heavy fall of rain on our watershed, viz., 3·02 in. at Tottiford, and 1·40 in. at Kennick. Of the 3·02 in. at Tottiford, 2·75 in. fell in 70 minutes, and at the same time there was a heavy fall of hail, some of the stones being quite an inch across. A large amount of soil was washed into our reservoirs, and no less than 186 cubic yards found its way into the Intake. The storm appeared to have its centre between the village of Lustleigh and our reservoirs, and the roads suffered severely.—W. INGHAM, A.M.I.C.E.

GLOUCESTER.

Upfield, Stroud.—Very severe TS from 4.30 to 5.30 p.m. R in that hour 1·62 in., and 0·33 in. more in the following two hours. Within a mile of here a tree, a brick wall and a brick chimney stack were struck, and a sheep was killed by L.—ROSE E. STANTON.

Further Barton, Cirencester.—Three heavy TSS took place: The first at noon, over in about an hour, when ·27 in, of R fell. The second began with T in the S.W. before 2.30 p.m.; at 3 p.m. two trees were struck by L about half-a-mile distant; the storm passed round to the E. The third came up also from the S.W.; R and H began at 5 p.m.; two violent claps of T, instantaneous with the L, at 5.15 p.m. and 5.30 p.m., when a Scotch fir had a strip of bark peeled off from top to bottom. The H stones caused great damage to apples and all vegetation; they were chiefly round, some with sharp points, but not pyramidal. Bar. steady; no wind. Total R 1·43 in.—E. BROWN.

NORTHUMBERLAND.

Pawston, Coldstream.—R 2·13 in., the heaviest fall in 24 hours since September, 1880. In the three days 19th to 21st, 3·10 in. fell, practically all in 48 hours.

July 21st.

MIDDLESEX.

Fairfield Road, Crouch End.—Severe TS, with heavy R and H the size of large peas or small marbles. Between 2.15 p.m. and 4.15 p.m. 1·90 in. of R fell, and in the 24 hours 2·09 in. Water found its way into the basements of houses where it had never been seen since they were built in 1887.—H. SOWERBY WALLIS.

Aubrey Road, Crouch End.—During the heavy TS here this afternoon exactly 2·00 in. of R fell (between 2 and 5 p.m.), the heaviest R being between 3 and 4.—W. B. BUTLER.

Finsbury Park.—Between 1.15 and 3.45 p.m. there fell 2·10 in. of R, of which, probably, two inches fell between 1.30 and 3.30 p.m. Between 3.45 and 5.30 p.m. there was a further fall of 0·43 in., making the total in less than four hours 2·53 in. At *Lordship Road, Stoke Newington*, in the same time there fell only 1·68 in.—EDMUND L. MORRIS, A.M.I.C.E.

Cazenove Road, Stoke Newington.—After the storm, my rain gauge recorded 3·18 in. For at least ten years no such amount has been measured in North London.—E. J. BENTLEY.

Camden Square is within three miles of all these stations, but the fall there was only 0·01 in.

BERKS.

The Elms, Faringdon.—Heavy TS, 0.30 to 1.25 p.m., in which time the R was 1·20 in. At Coleshill (Wilts), three miles off, there was no R.—W. DUNDAS.

BUCKS.

Addington, Winslow.—TS, a cow and a sheep killed. R ·73 in.—J. MATHISON.

SUFFOLK.

Bishop's Hill, Ipswich.—Violent TS, and the heaviest R I have ever seen; in one hour, between 4.15 and 5.15 p.m., there fell 2·95 in. In the first half hour the fall must have been at the rate of five or six inches an hour.—G. A. BIDDELL, M.I.C.E.

Clare Lodge, Ipswich.—Total R = 1·86 in.— E. R. TURNER, M.I.C.E.

Museum, Ipswich.—Total R 2·05 in.—FRANK WOOLNOUGH.

Nova Scotia House, Ipswich.—The TS began at 4 p.m. Noticing that the R was excessive, I went to my gauge (which holds about 2⅓ inches) at 4.30 p.m., expecting to find an inch or an inch and a half, but the bottle was nearly full, 2·20 in., which I poured away; at 5 p.m. I went again and measured 2·00 in.; at 6.30 p.m., when the storm was over, there was a further 0·82 in., so that there was 4·20 in. in an hour, and 5·02 in 2½ hours. There was much flooding, and some damage. I think that the centre must have been near here. One man declares that he saw a waterspout within 100 yards of this house. In another part of the town two boys and a pony were killed by the L.—G. F. GOWER.

HEREFORD.

Bodenham, Leominster.—R between noon and 2.30 p.m. 1·61 in.—H. C. STURGES.

July 24th.

PERTH.

Coupar Angus Station.—Severe TS; a house was struck by L and the chimney top demolished. R ·49 in.

GALWAY.

Queen's College, Galway.—Great TS, with 1·21 in. of R.

July 26th.

HERTS.

The Lawns, Southgate.—In less than an hour-and-a-half, 2·50 in. of R fell in a TS; the R commencing about 4.55 p.m. and lasting till about 6.20 p.m. A good sized oak tree about 3 ft. in circumference and about 40 yards from the house was struck by L and split from top to bottom, the bark being peeled completely off.—G. A. CHURCH.

SOME OLD STORMS.

1557.

"IN *Stow's Annals* is the following narration of a remarkable storm. . ." "On Sunday, 14th of August, 1557, between the hours of 9 and 10 o'clock in the forenoon, whilst the minister was

reading the second lesson in the parish church of Blythburg,* a town in Suffolk, a strange and terrible tempest of Lightening and Thunder struck through the wall of the same church into the ground, almost a yard deep; drove down all the people on that side of the church, above 20 persons; then renting the wall up to the Revestry, left the door, and returned to the steeple, rent the timber, brake the chains, and fled towards Bungay. The people that were stricken down were found grovelling more than half an hour after, whereof a man and a boy were found dead; the others were scorched."—*Suckling's Antiquities of Suffolk.*

1741, 1745.

The Rev. Laurence Sterne was Vicar of Sutton-on-the-Forest, eight miles north of York. The following entries in the parish register are signed by him:—

1741. Hail fell in the midst of summer as big as a Pidgeon's egg. W^ch unusual circumstance I thought fit to attest under my hand.—L. STERNE.

1745, May. A dismal storm of hail fell upon this Town, and some other adjacent ones wh^ch did considerable damage to the Windows and Corn. Many of the stones measured six inches in circumference. It broke almost all the south and west Windows of this House and my Vicarage House at Stillington [2 miles further N.]—L. STERNE.

WHIRLWINDS ON JUNE 30TH AND JULY 16TH.

HAY CARRIED AWAY AT NETHER PRIORS, HALSTEAD, N. ESSEX.

TRULY Essex is a wonderful county. Mr. Joseph Last, haybinder, of Halstead, sent information to the branch office of the *Essex County Chronicle* in that town on Wednesday, June 30th, respecting a whirlwind that took place in the hayfield at Nether Priors about noon. The writer stated that a large quantity of hay was taken up into the air and carried out of sight. Twelve men who were at work in the field watched the travelling of the hay in great amazement.

The next note shows where it fell, about three miles further North.

A SHOWER OF HAY AT BELCHAMP ST. PAUL, N. ESSEX.

About eleven o'clock on Wednesday morning a curious phenomenon was witnessed in this neighbourhood. For some minutes the atmosphere was laden with falling hay. Trees, shrubs, houses, all secured a fair portion of well-made meadow hay, which came down

* A village 4½ miles S.E. of Halesworth.

in a very fantastic manner, some quite large bunches being among the single bents. It is supposed to be the effect of a whirlwind on a distant hay field.

A SHOWER OF FROGS IN BIRMINGHAM.

During a storm that raged with considerable fury in Birmingham on Wednesday morning, June 30th, a shower of frogs fell in the suburb of Moseley. They were found scattered about several gardens. Almost white in colour, they had evidently been absorbed in a small waterspout that was driven over Birmingham by the tempest.

WHIRLWIND NEAR HEREFORD.

The haymakers in Mr. Hewitt's meadow at Hampton Park, Friday, July 16th, shortly after noon, were somewhat startled to see a number of the "cocks" suddenly collected together and carried straight up in the air. The cause of this rather unusual scene was a whirlwind. The hay was, after its ærial flight, scattered in all directions, and some fell at a distance away of quite a hundred yards.

OBJECTIONS TO MOUNTAIN OBSERVATORIES.

An American scientific paper argues that there are many objections to mountain stations. It says that the cost of building is very large. M. Vallot's Observatory on the flanks of Mont Blanc (14,321 feet) cost £15 a cubic meter. The cost of M. Janssen's small observatory building on the summit (15,781 feet) is said to have been £12,000. Again, such establishments are very expensive to maintain. Transportation to the summit of Mont Blanc costs about two shillings per pound, for example. There are difficulties in arranging for an adequate food and water supply (though melted snow is always available on the higher peaks). In the United States (owing to the deplorable policy in the matter of forest conservation) bush fires, which fill the air with haze, are very troublesome. On the highest peaks snow blindness is a constant danger. Mountain sickness (giddiness, nausea, great discomfort, and disorder) is almost always felt. The experiments of Mr. Whymper and others, in the high Andes and elsewhere, show that long residence at high levels may enable one to resist acute attacks of mountain sickness, but no amount of habitude, apparently, can counteract the "diminished living" which results from an insufficient supply of air for breathing. Observers at extreme altitudes must always be subjected to great discomfort, and their abilities must be correspondingly decreased. De Saussure, in his expedition to Mont Blanc, remarks that he required four-and-a-half hours on the mountain to perform experiments which took less than three hours in the valley. Here we have something like a numerical measure of the falling off in ability due to great altitude.—*Manchester City News*, Aug. 7th.

METEOROLOGY IN SCHOOLS.*

WEATHER forecasting has become a branch of study in many American schools, but especially in Boston. About 400 schools in New England now receive the daily weather maps from the U.S. Meteorological Bureau, showing the atmospheric conditions prevailing all over the country. These, as interpreted by the teachers, enable the pupils to comprehend the various factors which enter into the weather forecast. It is contended that this not only adds to an interest in natural phenomena, but is a practical introduction to scientific habits of observation. Of course, it involves instruction in the proper use of thermometers, barometers, and other instruments. Prizes for the best work in this branch of study have been offered in the New England lower schools.—*Tit-Bits*, Aug. 14th, 1897.

[Perhaps in the course of the next century even grown-up persons will have learned enough meteorology to know that it is better to get wet through in a thunderstorm, than to shelter under a tree. Even that does not seem to be generally taught yet.—ED. *M.M.*]

FLOODS IN SOUTHERN EUROPE.

DESCRIBING a perilous railway journey through the Austrian Tyrol after the rain had been falling continuously for four days, a correspondent writes:—Selecting the Innsbruck route, we reached Admont at ten in the morning, five hours late. Gangs of workmen accompanied the train, and were frequently employed removing landslips or repairing the lines, which in many places had been torn away by the raging torrent. At Admont I received the dismal news that we could proceed no further, and after waiting seven hours for instructions from headquarters, we learned that the train must return to Amstetten and proceed viâ Salzburg. All the passengers feared this retrograde journey, for the waters were still rising and the danger had manifestly increased. We had travelled a few miles only on the return road when our anticipations were realised, for a bridge, a structure of four or five arches, spanning the river and connecting a village near Hieflau, had been washed away since we had passed that morning. The scene in the corridor train itself was amusing and grotesque, for passenges of many countries and different tongues were vehemently making themselves understood by frantic gesticulations. We proceeded at a slow pace for several miles, drenched workmen walking in front of the engine, examining the permanent way. One bridge collapsed immediately our train had crossed over it. As we approached Amstetten the state of things was everywhere deplorable. Houses had been washed away and whole villages submerged. It was harvesting time, but there was no harvest. Through tracts of the most charming and fertile country, hundreds of miles in extent, the crops are entirely gone. We steamed into Amstetten Station about eight o'clock on Friday night; so, after twenty-three hours' anxious travel, we had actually accomplished a distance ordinarily covered in two or three hours from Vienna. Bridges had collapsed on the Salzburg and Munich route. The Linz

* See *Met. Mag.*, xxxi., p. 151.

line was flooded and in places washed away. Communication with Vienna was cut off, a railway bridge, with a passenger train, having fallen into the river at St. Polten. So Amstetten had become a veritable place of refuge. Several trains by various routes had returned to this village of some 2,000 or 3,000 inhabitants. For a dismal picture I can recall nothing to equal the sights at this station. Outside it was still raining in torrents. The hotels were full to their utmost capacity. Hundreds of weary and disappointed passengers, of all nationalities, and many families with children, could get no accommodation. Fortunately, a Continental station, with its café and restaurant, is better equipped to deal with such an emergency than would be the case at a wayside station in England. Several benevolent residents did yeoman service in finding rooms and beds for the stranded travellers. Amstetten is a very hospitable place, and it is pleasant to record that this band of gentlemen, to their own credit and to the honour of their town, rendered such acceptable assistance. By far the larger number of wayfarers found shelter for the night in the railway carriages, which the company placed at their disposal. Telegraphic communication was interrupted, and the following day (Saturday) railway traffic was suspended. Newspapers were not obtainable. The only news had its source in the local telephone office. Vienna itself was reported in danger, for the Danube in the preceding twenty-four hours had risen 12 ft. and was still rising. Such a mighty flood had it become that two miles from the bed of the river people were on the roofs of their dwellings, appealing for help, and the fortunate ones being rescued in boats. What I have witnessed along the course of one tributary of the Danube, was taking place in every valley in the Austrian Tyrol, and in Saxony and Bohemia the Elbe and its tributaries were making similar havoc.—*Daily Telegraph*, August 11th.

With reference to the above we hope to give some statistics in our next number, for we hear from Dr. Hellmann that he is preparing an account of the tremendous rainfall in Silesia, Saxony, Bohemia, &c., at the end of July. Some of the stations seem to have had about *twelve inches in four days.*

The only station in the neighbourhood of which particulars are given in the *Daily Weather Report* is Munich, where the mean annual rainfall is about 35 inches; the daily fall reported thence was—

	July 26th.	27th.	28th.	29th.	30th.	Total.
	in.	in.	in.	in.	in.	in.
Amount.....	0·35	1·22	0·47	0·75	1·42	4·21

REVIEWS.

The Story of the Earth's Atmosphere. By DOUGLAS ARCHIBALD, M.A., F.R.Met.Soc. London, 1897. Sm. 8vo.

ALTHOUGH the publishers (George Newnes, Limited) have not done us the honour of recognising our existence by sending us a copy of this work for review, we present them with one, because we think that our readers ought to know of this little book, which is very much better than either its title or its appearance suggests.

The author is one of the few who, while capable as mathematicians, will condescend, *and are able*, to convey to ordinary mortals the results arrived at by high class research. To all who wish to know the latest opinions as to why various atmospheric phenomena occur we strongly recommend this little book. In one respect it is, we think, unique—there are 208 pages by Douglas Archibald, and we have not seen a single mathematical expression; we do not think that there is even a + or a − in the whole book.

We have noticed very few slips; on page 38 probably Mr. Archibald is referring to something unknown to us, otherwise we think that "actinometer" should be "bolometer," and "Washington" should be "Mount Whitney." On page 134 he gives a new spelling of "Chirapunji;" it used to be Cherra Poongee; in 1864 Keith Johnston, in *Index Geographicus*, gave Chirra Punji *or* Chirra Poonjee; then in 1882 Mr. J. Eliot spelled it Cherrapunji; in 1890 Mr. Blanford gave Cherra Poonjee.

Illustrative Cloud Forms for the guidance of observers in the classification of clouds. Issued by the Hydrographic Office, Washington, U.S.A.; oblong, text 7 in. × 4 in., 16 coloured plates, 1897.

WE are not sure that it is desirable that there should be several cloud atlases in existence concurrently; but, probably, administrative difficulties would be raised if in any country copies of the *International Cloud Atlas* were purchased sufficient in number to supply an entire navy. This, probably, is the reason for the appearance of the present artistic little volume.

The Hydrographer (Captain Sigsbee, U.S.N.) in an introductory note points out that the classification, nomenclature and descriptive text are from the *International Cloud Atlas*, but everything else is American. The excellent colour lithography has been done by Messrs. L. Prang and Co. of Boston, and their representative worked in consultation with Mr. Cronan, who painted the cloud pictures which have been reproduced. Mr. Cronan had the further advantage of working from the I.C.A., from a collection of photos and other representations, and with the advice of Mr. Lawrence Rotch, Capt. Sigsbee and Mr. H. H. Clayton.

The result is a very handy little book, which satisfactorily meets its presumed object; some of the plates (vii., x., xi. and xiii.) are

excellent We do not say that iii. is incorrect, but it seems to us to have too much of the horizontal element in it, and we think that Mr. Cronan has not, in the mammato-cumulus, xiv., quite caught the idea of weight nearly breaking through a textile material (say, sand breaking through sacking) which is the characteristic of a perfect specimen of this cloud. Fig. 26 in the *International Cloud Atlas* is better in that respect, but it indicates rather too much separation—independence—between each mamma. Notwithstanding the extreme roughness of its execution, we think that the little woodcut in Dr. Clouston's *Explanation of the Popular Weather Prognostics of Scotland*, 1867, is more truthful and suggestive than either of its more costly successors.

THE INDEX TO THE "METEOROLOGICAL MAGAZINE."

WE see that it was in our number for March, 1896, that we promised to compile the above; but it was a heavy task, and it was only in July, 1897, that it was finished and the copies were completed, bound and sent to the subscribers.

As we anticipated, the subscription price of 2s. 6d. proved far too little; but as Mr. C. L. Brook (whose letter will be found on p. 24 of our last volume) has sent the very handsome contribution of £10 towards the cost, and, as we hope that a reasonable number of copies will be sold at the full price of 5s., we do not think that there will be any serious loss.

As stated in the Preface, we are greatly indebted to the Rev. T. A. Preston for his help; and, though the Index like most human things is not absolutely perfect, we are glad to hear from many quarters satisfactory assurances of its utility.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1896.

REGULAR TABLES.

Waringstown	February.	Total rain	*should be*	1·46	in.	*not*	1·26	in.
Cargen [Dumfries].....	March.	,,	,,	,,	,,	4·65	,,	,,	4·56	,,
Stroud, Upfield	April.	,,	,,	,,	,,	1·06	,,	,,	1·11	,,
Omagh, Edenfel.....	,,	,,	,,	,,	,,	2·42	,,	,,	2·52	,,

SUPPLEMENTARY TABLES.

Rendlesham Hall	January.	Total rain	*should be*	1·30	in.	*not*	1·24	in.
Northampton, Sedgebrook	March.	,,	,,	,,	,,	2·79	,,	,,	2·70	,,
Colchester, Lexden.....	,,	,,	,,	,,	,,	2·80	,,	,,	2·77	,,
Lough Swilly, Carrablagh	April.	,,	,,	,,	,,	2·93	,,	,,	2·87	,,
Killybegs	August.	,,	,,	,,	,,	4·32	,,	,,	4·27	,,
Lilliesleaf, Riddell	November.	,,	,,	,,	,,	1·04	,,	,,	1·14	,,

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	58·0	26	27·9	8	48·4	39·0	39·7	86	93·3	22·6	2·75	14	8·2
Malta	63·0	22*a*	43·2	19	60·8	50·8	48·5	75	136·5	...	·49	4	5·5
Mauritius	86·3	15	71·0	24	83·9	75·0	70·7	77	135·4	64·0	3·14	19	7·2
Calcutta	91·6	25	53·2	19	82·6	63·8	58·2	63	144·5	43·8	1·59	3	3·0
Bombay	83·6	17	63·3	28	81·4	68·1	63·8	69	131·5	51·8	·00	0	0·8
Ceylon, Colombo	90·4	13	70·8	5	88·6	75·0	72·3	78	146·0	68·8	1·68	11	4·7
Melbourne	95·6	18	48·9	22	74·2	57·3	55·3	72	143·0	39·5	2·97	13	6·9
Adelaide	107·3	10	52·9	26	86·3	64·5	53·7	48	163·9	42·5	1·80	8	5·1
Sydney	90·5	24	61·8	25	77·9	64·8	57·7	60	150·3	53·2	·46	7	3·7
Wellington	76·0	21	45·5	6	68·9	55·9	53·9	74	141·0	37·0	5·02	16	4·9
Auckland	82·0	2, 17	56·0	6	75·4	62·3	61·1	76	145·0	54·0	5·38	15	5·2
Jamaica, Kingston	92·3	26	65·8	14*b*	87·5	68·9	65·7	66	...	...	·00	0	2·5
Trinidad	90·0	5, 11	64·0	3, 4*b*	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada	86·0	2	69·8	28	83·5	72·3	66·2	64	152·0	...	2·03	12	1·7
Toronto	44·0	17	1·0	26	30·8	18·2	21·2	81	58·2	—3·3	2·34	12	7·4
New Brunswick, Fredericton	42·9	7	—18·4	28	29·0	4·3	9·7	66	...	...	1·53	7	4·3
Manitoba, Winnipeg	32·2	4	—41·0	25	13·3	—11·4	...	...	...	...	·89	6	4·5
British Columbia, Esquimalt	50·6	26	28·2	21	45·4	35·5	37·3	89	...	...	3·63	19	8·1

a—and 23. *b*—and 15.

REMARKS.

MALTA.—Adopted mean temp. 55°·3, or 1°·5 above the average. Mean hourly velocity of wind 12·8 miles. TS on 9th. Mean temp. of sea 59°·1. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 0°·7 above, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 16·1 miles, or 4·6 above the average; extremes 29·3 on 22nd and 2·8 on 20th; prevailing direction E. by S. The driest February since 1876, excepting 1885, 2·16 in.; 1893, 2·42 in.; and 1895, 2·97 in. T and L on 20th. L on 27th. T. F. CLAXTON.

Adelaide.—Mean temp. 1°·7 above the average of 40 years; a very hot spell occurring from the 7th to the 18th, the temp. rising above 100° in the shade on 5 days, and over 90° on 10 consecutive days. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·5 above, rainfall 4·91 in. below, and humidity 15 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part, with a few light showers; from 9th to 16th wet, the max. rainfall (1·50 in.) being recorded on 13th; from 16th to 22nd, fine with moderate winds, chiefly northerly; remainder of the month showery and dull. Temp. 0°·1 below, and R 1·48 in. above, their respective averages. Slight double earthquake, shock at 9.4 p.m. on 27th. R. B. GORE.

Auckland.—A wet and disagreeable month, the rainfall being nearly two inches above the average. Heavy gale from N.E. on 11th and 12th, and again on 27th and 28th. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·94 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·61	XI.	Rhayader, Nantgwillt ...	3·15
II.	Dorking, Abinger Hall .	1·88	,,	Lake Vyrnwy	...
,,	Birchington, Thor	·51	,,	Corwen, Rhug	1·30
,,	Hailsham	·38	,,	Criccieth, Talarvor	1·51
,,	Ryde, Thornbrough	·75	,,	I. of Man, Douglas	1·56
,,	Emsworth, Redlands ...	·57	XII.	Stoneykirk, Ardwell Ho.	1·73
,,	Alton, Ashdell	·87	,,	New Galloway, Glenlee	2·46
III.	Oxford, Magdalen Col..	1·76	,,	Moniavie, Maxwelton Ho.	2·15
,,	Banbury, Bloxham	·52	,,	Lilliesleaf, Riddell	2·47
,,	Northampton, Sedgebrook	·30	XIII.	N. Esk Res. [Penicuick]	2·65
,,	Duddington [Stamford].	·13	XIV.	Glasgow, Queen's Park..	2·22
,,	Alconbury	·08	XV.	Inverary, Newtown	6·76
,,	Wisbech, Bank House...	·60	,,	Oban, The Corran	5·11
IV.	Southend	·82	,,	Islay, Gruinart School ...	1·00
,,	Harlow, Sheering..... ...	·75	XVI.	Dollar.....	1·73
,,	Colchester, Lexden	·47	,,	Balquhidder, Stronvar...	3·71
,,	Rendlesham Hall	·63	,,	Ballinluig	1·06
,,	Rushall Vicarage	1·22	,,	Dalnaspidal H.R.S.....	2·98
,,	Swaffham	·71	XVII.	Keith H.R.S.....	1·82
V.	Salisbury, Alderbury ...	·72	,,	Forres H.R.S.	·72
,,	Bishop's Cannings	1·30	XVIII.	Fearn, Lower Pitkerrie..	·55
,,	Blandford, Whatcombe .	·39	,,	N. Uist, Loch Maddy ...	3·69
,,	Ashburton, Holne Vic...	1·44	,,	Invergarry	1·24
,,	Okehampton, Oaklands.	1·89	,,	Aviemore H.R.S.	1·38
,,	Hartland Abbey	2·49	,,	Loch Ness, Drumnadrochit	2·22
,,	Lynmouth, Glenthorne.	1·82	XIX.	Invershin	1·83
,,	Probus, Lamellyn	2·38	,,	Scourie	...
,,	Wellington, The Avenue	1·33	,,	Watten H.R.S.....	1·51
,,	Wincanton.....	·69	XX.	Dunmanway, Coolkelure	2·58
VI.	Clifton, Pembroke Road	1·83	,,	Cork, Wellesley Terrace	1·19
,,	Ross, The Graig	...	,,	Killarney, Woodlawn ...	2·26
,,	Wem, Clive Vicarage ...	·61	,,	Caher, Duneske	1·33
,,	Cheadle, The Heath Ho.	·95	,,	Ballingarry, Hazelfort...	2·51
,,	Worcester, Diglis Lock	·54	,,	Limerick, Kilcornan ...	2·02
,,	Coventry, Priory Row ..	·25	,,	Broadford, Hurdlestown	3·39
VII.	Grantham, Stainby	·38	,,	Miltown Malbay	...
,,	Horncastle, Bucknall ...	1·26	XXI.	Gorey, Courtown House	1·69
,,	Worksop, Hodsck Priory	·57	,,	Athlone, Twyford	3·23
VIII.	Neston, Hinderton	·78	,,	Mullingar, Belvedere ...	2·57
,,	Southport, Hesketh Park	1·27	,,	Longford, Currygrane...	2·85
,,	Broughton-in-Furness ...	2·56	XXII.	Woodlawn	2·46
IX.	Ripon, Mickley.....	1·03	,,	Crossmolina, Enniscoe ..	3·73
,,	Melmerby, Baldersby ...	1·29	,,	Collooney, Markree Obs.	3·67
,,	Scarborough, Observat'y	·58	,,	Ballinamore, Lawderdale	3·34
,,	Middleton, Mickleton ...	1·55	XXIII.	Warrenpoint.....	1·67
X.	Haltwhistle, Unthank...	1·91	,,	Seaforde.....	1·33
,,	Bamburgh	2·05	,,	Belfast, Springfield	2·34
,,	Keswick, The Bank	2·49	,,	Bushmills, Dundarave..	2·33
XI.	Llanfrechfa Grange	2·21	,,	Stewartstown	2·49
,,	Llandovery	2·29	,,	Killybegs	4·52
,,	Castle Malgwyn	2·29	,,	Lough Swilly, Carrablagh	2·82
,,	Builth, Abergwesyn Vic.	3·33			

JULY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Dat
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	·64	— 2·04	·38	19	8	83·6	24	44·0	8
II.		Tenterden	·75	— 1·60	·42	19	7	81·0	17	44·0	8
,,		Strathfieldsaye	1·67	...	·56	26	4	...	...	...	...
III.		Hitchin	·80	— 1·92	·60	20	4	81·0	24*a*	40·0	7
,,		Winslow (Addington)	1·53	— 1·76	·73	21	6	81·0	30	38·0	8
IV.		Bury St. Edmunds (Westley)	·73	— 1·84	·54	20	4	76·0	24	47·0	8
,,		Norwich (Brundall)	·67	...	·21	24	7	85·0	24	42·1	8
V.		Weymouth(LangtonHerring)	·41	— 1·74	·18	19	7	78·0	31	46·0	8
,,		Torquay (Cary Green)	·88	...	·33	19	6	78·7	16	46·0	8
,,		Polapit Tamar [Launceston]..	3·68	+ ·27	1·77	20	12	...	...	...	...
VI.		Stroud (Upfield)	2·91	— ·66	2·00	20	10	83·0	16*b*	50·0	4
,,		ChurchStretton(Woolstaston)	·99	— 1·98	·45	25	8	80·5	16	44·5	7
,,		Tenbury (Orleton)	1·50	— 1·36	·50	19	10	86·5	16	37·7	8
VII.		Leicester (Rotherby Hall) ...	·42	...	·13	25	6	80·0	23*c*	35·0	8
,,		Boston	1·78	— 1·01	·67	26	7	82·0	30	40·0	8
,,		Hesley Hall [Tickhill].....	·52	— 2·15	·12	1	7	81·0	18*d*	40·0	11
VIII.		Manchester(PlymouthGrove)	1·73	— 2·06	·60	26	12	83·0	18	45·0	6
IX.		Wetherby (Ribston Hall) ...	·46	— 2·72	·19	25	7	...	...	...	...
,,		Skipton (Arncliffe)	2·74	— 2·90	·62	7	13	...	...	...	...
,,		Hull (Pearson Park).	·40	— 2·19	·22	25	7	80·0	23	40·0	11
X.		Newcastle (Town Moor)	1·39	— 2·13	·88	20	10	...	...	...	...
,,		Borrowdale (Seathwaite).....	7·88	— 3·11	2·57	8	14	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·41	— 2·65	·54	19	11	...	...	...	...
,,		Haverfordwest	3·00	— 1·21	·83	19	14	81·0	16	41·0	8
,,		Aberystwith (Gogerddan) ...	2·88	...	1·15	18	11	84·0	15	37·0	10
,,		Llandudno.....	·87	— 2·13	·21	8	7	76·5	31	47·6	11
XII.	SCOTLAND.	Cargen [Dumfries]	1·60	— 2·33	·36	20	9	81·6	15	40·6	11
XIII.		Edinburgh (Blacket Place)...	1·82	...	·71	20	10	81·0	15	43·3	8
XIV.		Colmonell	1·89	...	·40	8	10	80·0	31	35·0	10
XV.		Lochgilphead (Kilmory).....	3·61	— ·69	·58	28	14	...	...	39·0	10
,,		Mull (Quinish).....	4·99	+ ·94	1·04	23	14	...	...	...	...
XVI.		Loch Leven Sluices	1·80	— 1·82	·30	9	10	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·25	— 1·21	1·60	24	10	82·1	15	41·9	8
XVII.		Braemar	1·76	— 1·45	·95	24	13	77·7	15	35·4	11
,,		Aberdeen (Cranford)	1·74	...	·83	24	14	74·0	23*d*	35·0	7
,,		Cawdor (Budgate)	1·04	— 2·26	·18	6, 27	13	...	...	...	...
XVIII		Strathconan [Beauly]	4·30	+ ·80	1·54	5	11	...	...	...	...
,,		Glencarron Lodge.....	7·55	...	1·47	6	16	79·9	15	39·6	11
XIX.		Dunrobin	1·03	— 1·82	·28	25	9	77·8	15	41·0	8
,,		S. Ronaldsay (Roeberry).....	1·58	— ·78	·42	5	13	74·0	24	44·0	6,
XX.	IRELAND.	Darrynane Abbey.....	1·88	...	·42	24	18	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·97	— 1·56	·82	19	16	77·0	16	39·5	8
,,		O'Briensbridge (Ross)	3·39	...	·57	23	14	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·53	— 1·99	·39	19	12	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·65	— 1·03	·29	26	12	75·1	23	46·1	11
XXII.		Ballinasloe	2·47	— 1·08	·50	23	16	75·0	31	45·0	7
,,		Clifden (Kylemore)	4·77	...	1·34	26	16	...	...	...	...
XXIII		Waringstown	1·37	— 2·15	·55	24	9	85·0	16	42·0	15
,,		Londonderry (Creggan Res.).	2·19	— 1·93	·44	24	15	...	...	...	...
,,		Omagh (Edenfel)	3·59	— ·13	1·70	24	14	80·0	15	43·0	7

+Shows that the fall was above the average ; —that it was below it.

a—and 30. *b*—and 18. *c*—and 24, 30. *d*—and 24. *e*—and 12. *f*—and 7, 10

METEOROLOGICAL NOTES ON JULY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

TENTERDEN.—A dry, hot month, grass very much burnt up, flowers and fruit also felt the effect of east winds and scorching sun, only on one day was the temp. in shade above 80°, against five in 1896. Duration of sunshine almost exactly the same, 249 hours. Other gauges in the district received much less R in the TS of 19th. Sharp TS on 21st. Slight TS on 27th. Fog on 17th and 23rd.

ADDINGTON.—A very fine month, grand weather for haymaking. From 28th June until 19th July, only one little shower fell. The storms on the 20th and 21st were very local. On the 20th, four miles S.E., hay was being carried all the time it rained here, and five miles W. there was just a sprinkling. The TS of the 21st was very sharp. In an adjoining parish some workmen had a narrow escape, a cow being killed under a tree a few yards from where they were standing; a sheep was also killed in Claydon parish. The night of the 8th was cold for July, the thermometer on the grass falling to 35°.

BURY ST. EDMUNDS, WESTLEY.—A very dry, hot month, with much sunshine. Wheat cutting began on the 26th. Barley much injured by want of rain. Heavy TS on 20th. TS on 21st; distant T on 22nd.

NORWICH, BRUNDALL.—Mean temp. 0°·8 lower than the previous July, and rainfall 2·22 in. below the average. T and L on 20th and 26th. T on 21st.

WEYMOUTH, LANGTON HERRING.—With the exception of July, 1885, when only ·25 in. of R fell, the driest July in 23 years. The mean temp at 9 a.m., 64°·8, is 2° above the average. The mean max., 71°·7, has been exceeded only once in 26 years, in 1878, when it was 72°·6. A very fine month; oats carried under favourable conditions. T on the 18th; fog on the 23rd.

TORQUAY, CARY GREEN.—Rainfall 1·85 in. below the average. Mean temp. 63° 0 or 1°·7 above the average. Duration of sunshine 246 hours 25 minutes, being 56 hours 25 minutes above the average; one sunless day.

POLAPIT TAMAR [LAUNCESTON].—A severe TS, with frequent vivid L, heavy T, and torrents of R shortly before 1 p.m. on the 20th. After 45 minutes ·84 in. was measured, and in all probability ·80 in. fell in 30 minutes. In 2 hours 20 minutes 1·29 in. had fallen, and at 8.30 p.m., or in 7 hrs. 30 min., a total of 1·62 in. was registered.

STROUD, UPFIELD—TSS on 20th, 25th and 26th.

WOOLSTASTON.—Very hot and very dry, little R till the 24th and 25th, when there were repeated short violent storms. Mean temp. 61°·5.

TENBURY, ORLETON.—A very fine, hot month, with a large percentage of bright sunshine. The temp. rose above 70° on 21 days, and above 80° on 6 days. Very little T was heard, and no L seen during the month.

ROTHERBY HALL.—Though July was generally hot and dry, the rainfall here is still 1·60 in. in excess of that for the first seven months of 1896. On the 8th the thermometer on the grass fell to 32°, which is the lowest on record here for July. The mean shade temp. was 59°. T on 21st, 25th, and 26th.

BOSTON.—On the 21st a heavy thundershower occurred, the R being partial. In the town 1·36 in. was registered, others recorded 1·26 and 1·80, and at the Witham Grand Sluice 2·17 in. At Kirton, 4 miles away, no rain fell.

MANCHESTER, PLYMOUTH GROVE.—Unsettled up to the 9th, then fine, summer weather, from 10th to 22nd, and on 30th and 31st. T and L on 5th, TS on 25th. Mean temp. 61°·5.

SKIPTON, ARNCLIFFE.—A dry month.

WALES.

HAVERFORDWEST.—The magnificent weather of June was prolonged, with the exception of small falls of R on 6th and 7th, up to the 18th, and one of the

finest hay harvests known for many years was saved in grand weather. A sudden change took place on the 18th, and R came just in time to save green crops from the devastation of the fly, and the crops generally from failure owing to excessive high temp. and drought. Max. in sun, 132°·8 on 16th. Fruit crops a total failure. Prevailing wind S.S.E., N.N.W. and S.E. The night temperatures were unusually high. On 19th and 20th, 1·66 in. of R fell in 36 hours.

ABERYSTWITH, GOGERDDAN.—A very hot, dry month, with a few TSS.

SCOTLAND.

CARGEN [DUMFRIES].—The climatic conditions of the month were the most favourable experienced for many years. Temp. and sunshine approximate very closely to the returns for the Jubilee year 1887, the mean temp. during the month (60°·3) of that year being 0°·4 higher than that just recorded; no higher mean temp. for July has been recorded during the intervening years. It is worthy of remark, that in the "seventies" the mean temp. of this month exceeded 60° five times; in the "eighties" only once; while in the "nineties," so far, that figure has not yet been reached. The hours of sunshine are two more than recorded in 1887, and have only once (in 1878) been exceeded during the last 38 years. The rainfall for the month is the least recorded since 1878, and is about one-half of the average. Light easterly winds have been most prevalent. The weather was exceptionally favourable for farm work. Rye grass hay was secured in splendid condition, and good progress was made with an unusually heavy crop of meadow hay. Harvest will be about three weeks later than last year, and will not be general before the latter end of August; an abundant yield of both grain and straw is anticipated. T on 24th and 27th.

EDINBURGH, BLACKET PLACE.—The feature of the month was the very large amount of bright sunshine, 232 hours being recorded. Fog at night on 13th, TSS on 24th, and T on 25th.

COLMONELL.—R 1·74 in. less than, and mean temp. 2°·1 above, the average of 21 years.

BRAEMAR.—An excellent, forward, growing month.

ABERDEEN, CRANFORD.—A heavy TS on the 24th.

S. RONALDSAY, ROEBERRY.—A fine month upon the whole, with the exception of two cold snaps. Mean temp. 55°·7, or 1°·1 above the average of seven years. A slight TS on morning of 25th.

IRELAND.

DARRYNANE ABBEY.—A foggy, misty month, very warm at the end. T between midnight and 1 a.m. on 24th.

WATERFORD, BROOK LODGE.—Broken weather, with spells of east wind and a good deal of fog at night. Heavy T on 20th.

O'BRIENSBRIDGE, ROSS.—Bright from 8th to 16th; close and sultry without sunshine for most part of the latter half. The last two days very warm.

DUBLIN, FITZ WILLIAM SQUARE.—A very favourable month, with sufficient R and of average temp. Mean temp. 61°·1, or 0°·5 above the average. Temp. reached or exceeded 70° in the screen on 7 days. In July, 1887, the temp. reached or exceeded 70° in the screen on no fewer than 17 days; while in 1888, the maximum for July was only 68°·7. TS on the evening of the 21st. Solar halo on the 4th. H on the 6th and 26th. Foggy on the 16th, 21st and 31st.

WARINGSTOWN.—Splendid weather all the month; the best hay harvest remembered; all crops good.

EDENFEL.—After the abnormal and persistent R and unsettled weather of June, July has been somewhat in the nature of a pleasant surprise. After the first week a complete—and what has turned out a permanent—change for the better took place, and with considerable sunshine, warmth and but occasional torrential showers, all crops now afford the promise of great abundance.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

BRITISH RAINFALL.

Subscriptions of £1 and upwards, or payments for publications to that amount, received to September 14th, 1897 :—

	£	s.	d.		£	s.	d.
Blackburn, Corporation of..	1	1	0	Gray, The Earl ... (2 years)	1	0	0
Plymouth, ,, ,...	1	1	0	Harvey, M. W., Esq., C.E.	1	1	0
Bridport, Viscount	1	0	0	Latham, T., Esq.	1	0	0
Bute, The Marquess of	10	0	0	Marsian, C.P., Esq. C.E. (2yrs.)	1	0	0
Campbell, J. A., Esq., M.P.	1	0	0	Smith, H. R., Esq., C.E. ...	1	0	0
Gosling, Col.	1	0	0				

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.,
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental. Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 15s.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXX.] SEPTEMBER, 1897. [Price Fourpence. or 5s. per ann. post free.

The Hon. Ralph Abercromby,

1842–1897.

We should have mentioned in an earlier number the loss which meteorology sustained by the death in Sydney, N.S.W., of Mr. Abercromby, but that the first news came only by telegraph, and we clung to the hope that it might not be true; but unhappily it is, and we shall no more hear the calm, clear voice, always gentle, always instructive.

It is impossible within ordinary limits to enumerate the works and papers issued by Mr. Abercromby between 1874 and 1894—there must be 50 or 60. Some of the important ones, "Weather," "Seas and Skies in many Latitudes," "Instructions for observing Clouds," and "Principles of Forecasting by means of Weather Charts," have been noticed in these pages. Had his physique been equal to his brain power, Abercromby would have taken quite an exceptional position, for, in spite of ill-health, he was a leader who turned out much, and valuable, work. Even when too ill to write himself, Mr. Abercromby manifested his lifelong interest in meteorology by offering prizes for meteorological essays, and by freely distributing copies of the papers which he enabled others to write.

Although he died in Australia, far from his relatives, it is a comfort to think that while fading away, he had the sympathy and care of a brother meteorologist, Mr. H. C. Russell, F.R.S., of Sydney Observatory.

FROMONDUS.

To the Editor of the Meteorological Magazine.

Sir,—I am obliged by your notice in the *Meteorological Magazine* of the article upon Fromondus, by M. l'Abbé Monchamp, which appeared recently in *Ciel et Terre*.

There is one passage in the article which you have not correctly translated. You say "Prof. Monchamp regards the record of the weather kept by Froidmont in 1614 and 1625 as 'the earliest kept

in Belgium if not in the world.'" If M. Monchamp had used those words, I certainly should not have allowed them to appear, for every one familiar with meteorological work knows of Tyge Brahe's *Meteorologiske Dagbog* and of *Merle's MS.* M. Monchamp wrote, "Trouverait on *beaucoup de* séries d'observations météorologiques antérieures à cette époque, même faites sans le secours d'instruments?" This is very different from what you printed in the *Meteorological Magazine*, and far from suggesting that the author considered Froidmont's observations as the oldest known. (1)

With respect to the remark concerning the zodiacal light, it seems to me more plausible than to attribute the phenomenon to a bolide. But we must not forget that in ancient times exaggeration was frequent. (2)

I can add to your list of editions of Fromondus one more—Anvers, 1634—on the authority of the *Biographie Nationale*, published by the *Académie des Sciences.* (3)

Yours very truly,

A. LANCASTER.

Observatoire Royal de Belgique.

[No one likes to have made a mistake, but we really think that it was fortunate that we did, because it has elicited M. Lancaster's letter and will perhaps bear further fruit. We have added numerals to the paragraphs of M. Lancaster's letter, and employ the same in the following comments:—

(1) Our fault; we overlooked the words which we have now printed in italics, "*beaucoup de.*" While upon this subject, we think it well to inquire, whether it would not be desirable to compile a list of journals of the weather prior to 1650, after which date they became common.

(2) We cannot accept the idea of a zodiacal light strong enough to dim the midnight brightness of the moon. Our readers have now M. Lancaster's opinion and our own, and there we must leave the matter. The passage in the original is—"Et à fido teste nuper audivi, autumno anni 1625, ingentem trabis molem, intempestâ nocte, ab Occasu exortam, paullatimque ad cæli culmen evectam, Lunam clarissimè splendentem infuscasse."

(3) We are very glad to add to the list of editions that mentioned by M. Lancaster. We had consulted his very valuable *Catalogue des ouvrages d'Astronomie, &c.*, but it is not mentioned there; perhaps there is now no copy in existence.

Mr. Prince, of Crowborough, has a copy of edition E, and points out that according to the signatures it is a 4to, and that therefore the entry under F is superfluous. We object to a page 5·4 in. by 3·2 in. being called a 4to; but as it is evident from the signatures that

it was printed in 8's, we suppose that the paper was *half sheets*. However that may have been, this is a capital illustration of the muddle as to sizes of which we complained on p. 102, and it could not have been cleared up had not Mr. Prince sent us the precise space on each page occupied by type.—ED.]

BUYS-BALLOT.

WE do not often reprint what we have written, but it is seven years since the following note appeared, and we think that no stronger appeal could be made than by this brief narrative of facts.

Buys-Ballot.

One by one, with saddening frequency, those whose names are known to Meteorologists of all countries are leaving us. On Sunday night, February 2nd, 1890, from his well-loved home at Utrecht, passed away the spirit which gave to the world the useful "Buys-Ballot's Law," by which the author will be remembered long after his many personal friends have themselves been removed. Prof. Buys-Ballot was often in this country; he was a corresponding member of the British Association, and attended its meetings, and he was one of the nineteen honorary members of the Royal Meteorological Society. He was 72 years of age, was an honorary member of the Society of Arts, of the German and of the Austrian Meteorological Societies, and Knight or Commander of Orders in Austria, Netherlands, Portugal and Prussia.

Besides discharging the duties of his Professorship from 1847 to 1887, Dr. Ballot was director, indeed almost creator, of the Royal Meteorological Institute of the Netherlands. In 1883 a new island, discovered by the Dutch Meteorological Expedition, in 70° 25′ 28″ N., was named after him as Buys-Ballot's Island, and in 1887, on giving up his professorial duties, a sort of International banquet was given in his honour, and he was presented with a gold medal specially struck to commemorate the event. Dr. Ballot's earliest scientific papers were upon chemistry and physics, but for forty years nearly all his time and thought has been devoted to meteorology, and his contributions have appeared not only in Dutch, but in German, French, and English.

The old buildings in which Buys-Ballot worked for 40 years have had to be pulled down. A new Royal Dutch Meteorological Institute has been erected at De Bilt, near Utrecht, and his countrymen, successors and co-labourers desire to place at it a monumental bust to his memory. Nearly all the leading meteorologists in both hemispheres have formed an international committee to co-operate with Buys-Ballot's own countrymen in raising the necessary funds, and we gladly comply with their request to lay the matter before our readers, and shall be happy to acknowledge and forward any donations which any of them may feel inclined to send. Our own personal view of the matter is that no very large sum is required, but that the greater the number of contributors, the more would it be evidence of the esteem in which the deceased was held.

CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE IN 1896.

It will, perhaps, be conducive to the convenience of our readers if we arrange our remarks on the annual summary of our monthly climatological tables under the various headings as set out, while it will not make them much more fragmentary than would be the case under any other arrangement.

Max. shade temp. Adelaide, as is the case in about three years out of four, recorded the highest shade temp., but the reading, though above the average, is not remarkable. The value of 104°·8 at Malta appears to be unprecedented; the temp. having risen above 100° in only six out of thirteen years. At Calcutta, 1896 was apparently remarkably warm, as the mean temp. and the mean max. are the highest from 1877 onwards, while the absolute max. (106°·8) was exceeded only in 1895. On the other hand, the absolute min. (45°·5) is the lowest in any year of the same period.

Min. shade temp. and mean min. Greatest total range and greatest daily range. No other station has ever approached Winnipeg in these elements, but the 1896 values are normal, and call for no special comment.

Least total range and least daily range. Grenada, which records these two extremes, has only recently been added to the tables, but the values appear to be normal, and are very similar to those which in former years were obtained at Barbados.

Highest mean temp. Ceylon has every year yielded the highest mean temp., though the average of fifteen years at Bombay is less than a degree lower. The 1896 record of 81°·5 has been exceeded only twice in seventeen years, namely, by 81°·9 in 1878, and 81°·7 in 1895.

Driest and dampest stations. Adelaide has for many years recorded the lowest relative humidity, and Esquimalt, since its inclusion in the tables in 1891, the opposite extreme. The 1896 records, 59 and 87 respectively, are not remarkable.

Max. in sun and min. on grass. These records are, perhaps, so much dependent on the instruments and their exposure, as to be incapable of strict comparison, but Trinidad always yields very high values. In the absence of a grass minimum at Winnipeg, Toronto has always given the lowest radiation temp.

Greatest and least rainfall. The variation in the amounts of rainfall at the stations included in our tables has always been less than the variation between different parts of England in an ordinary year, and the 1896 extremes are not unprecedented, though the Adelaide total (15·17 in.) is much below the average. The Mauritius fall of 68·17 in. is the greatest in any year from 1877 onwards, that, with a total of 60·36 in., being the only other year with more than 60 inches. Curiously, the number of rainy days is the smallest, with two exceptions, in the same period.

Most and least cloud. Esquimalt has for some years recorded the greatest amount of cloud, but does not show a great excess over London. Grenada, apparently, rivals Malta in the clearness of its skies, though some years back the latter station gave a yearly mean of 2·9. The average for the five years, 1884-88, is 3·4, while for the five years 1892-96, the average is 4·5. Is it possible that there has been a change of observer and also of personal equation?

We received some time since from a gentleman (whose name we could not read, and therefore to whom we could not reply) a criticism of a reprint of one of these articles. The reprint implied that we stated some temperature to be the highest in the world (!) Of course, it is obvious that the extremes refer only to the 18 stations enumerated on p. 122.

SUMMARY.

Highest temp. in shade	111°·2 at Adelaide on January 23rd.
Lowest „ „	–45°·2 at Winnipeg on January 4th.
Greatest range in year	135°·7 at Winnipeg.
Least „ „	21°·2 at Grenada.
Greatest mean daily range ...	22°·5 at Winnipeg.
Least „ „ „ ...	9°·3 at Grenada.
Highest mean temp.	81°·5 at Colombo, Ceylon.
Lowest „ „	33°·4 at Winnipeg.
Driest station	Adelaide, mean humidity 59.
Dampest station	Esquimalt, „ „ 87.
Highest temp. in sun	177°·0 Trinidad.
Lowest temp. on grass	–23°·5 at Toronto*.
Greatest rainfall	101·06 in. at Colombo, Ceylon.
Least „	15·17 in. at Adelaide.
Most cloudy station	Esquimalt, average amount 6·9.
Least „ „	Grenada, average amount 3·6.

* The min. on grass is not recorded at Winnipeg.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1896.

Stations. *Those in Italics are South of the Equator.*	Absolute.				Average.					Absolute.		Total Rain.		Average.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.										
	°		°		°	°	°	°		°	°	in.		0—10
England, London ...	88·7	July 14	23·2	February 26	58·5	43·3	50·9	43·7	80	135·9	19·1	23·52	159	6·3
Malta	104·8	August 11	40·1	January 21, February 18	71·9	59·2	65·5	56·1	77	152·0	33·0	21·96	79	5·3
Mauritius	86·6	Dec. 19, 21	57·0	July 5	79·0	68·7	73·8	64·5	76	138·2	46·6	68·17	175	5·6
Calcutta	106·8	April 15	45·5	December 22	88·1	70·6	79·4	67·4	70	159·5	35·3	53·22	76	4·1
Bombay	95·0	October 29	63·2	December 31	86·7	76·0	81·4	72·5	75	143·7	51·9	87·65	102	..
Ceylon, Colombo ...	93·4	February 27	67·5	February 2	87·1	75·8	81·5	73·0	80	162·0	60·0	101·06	193	5·9
Melbourne	108·0	January 23	32·9	July 31	67·0	49·5	58·2	48·8	72	155·0	23·0	24·89	124	5·9
Adelaide.....	111·2	January 23	34·4	July 10	73·8	53·0	63·4	47·4	59	172·0	26·4	15·17	121	4·8
Sydney	108·5	January 13	39·8	July 2	69·6	56·6	63·1	56·5	76	160·9	27·9	42·42	157	4·7
Wellington.....	79·0	February 22	34·0	Aug. 5, 6, 10, October 1	61·5	49·5	55·5	46·6	73	141·0	21·0	57·54	179	4·5
Auckland	84·0	February 8	38·0	August 11	65·9	53·1	59·5	50·1	72	147·0	32·0	37·79	...	5·3
Jamaica, Kingston..	93·9	July 13	62·7	January 15	87·8	71·9	79·9	69·1	72	...	...	19·01	81	5·0
Trinidad.....	94·0	May 19, 20, June 6	61·0	March 15	88·3	70·3	79·3	72·0	80	177·0	60·0	66·45	178	..
Grenada	88·4	October 19	67·2	November 30	82·9	73·6	78·3	70·4	76	161·8	...	99·94	243	3·6
Toronto	91·3	July 12	—17·2	February 17	54·1	36·8	45·4	38·7	75	107·0	—23·5	29·14	144	5·9
New Brunswick, Fredericton.....	92·7	August 11	—20·0	February 18	50·2	29·0	39·6	32·3	69	...	...	39·17	128	5·2
Manitoba Winnipeg	90·5	July 1	—45·2	January 4	44·7	22·2	33·4	...	...	...	...	26·29	143	5·7
British Columbia, Esquimalt	86·4	June 26	16·7	November 27	55·3	41·4	48·4	43·6	87	...	..	46·47	157	6·9

HIGH TEMPERATURE ON THE NIGHT OF AUGUST 4TH.

To the Editor of the Meteorological Magazine.

SIR,—The minimum temperature as registered in my Stevenson screen on the night of Wednesday, August 4th [*i.e.*, the min. of August 5th.—ED.] was 65°. This is the highest minimum I have recorded during 11 years; the nearest approach to it being 63°·7 on July 1st, 1894. The maximum during the previous day had been 82°·8, with a strong S.E. wind. It came over partially cloudy during the evening, and about 7 o'clock there was a slight shower, yielding ·01 in.; notwithstanding this shower the temperature at 10 p.m. was 70°. The above readings are certainly very unusual in North Lancashire. The screen is situate about 74 ft. above sea level. The thermometers are by Negretti and Zambra, and have Kew certificates.

Yours faithfully,

SYDNEY WILSON.

Bruna Croft, Garstang, August 5th, 1897.

We confess to having a feeling of ignorance on the subject of high minimum temperatures, and, therefore, on receipt of the above referred to our own records. The minimum at Camden Square on the 5th was 59°·4, a value exceeded by 61°·1 on 6th, and by 60°·4 on 11th.

Looking back over the 40 years, 1858 to 1897, over which the record extends, we find no fewer than 85 instances of min. temp. of 60°, or upwards, in August, an average of rather more than two per annum, while the years in which the August minima were invariably below 60° are 1860, 1862, 1866, 1869, 1872, 1874, 1879, 1881, 1885, 1889, and 1894; in all eleven, or about one year in four. Taking now the highest record in 1897 (61°·1) we find 36 instances, or rather less than one per annum, in which it was exceeded, the most remarkable August being that of 1893, when for nine consecutive days the shade temp. did not fall below 60°.

Min. in shade August, 1893.

9th ..... 60°·0	12th ..... 63°·3	15th ..... 64°·1
10th ..... 63·9	13th ..... 60·2	16th ..... 63·8
11th ..... 61·8	14th ..... 61·3	17th ..... 63·7

In six Augusts there were five or more days on which the temp. did not fall below 60°, namely :—

1868 ..... 5 days.	1876 ..... 5 days.	1884 ..... 6 days.
1875 ..... 6 ,,	1877 ..... 5 ,,	1893 ..... 9 ,,

On fifteen days in the 40 Augusts the min. did not fall below 63°, the records of 64°, or upwards, being :—

Aug. 18th, 1858 ..... 67°·0.	Aug. 18th, 1876 ..... 65°·8.
,, 7th. 1868 ..... 64·0.	,, 18th, 1893 ..... 64·1

From this it is obvious that the Camden Square minima on August 5th and 6th, 1897, were in no way remarkable, but it must not be for-

gotten (I.) that the reading at Garstang was nearly 4° higher, and (II.) that what is an average reading at London may be a very exceptional one in North Lancashire.

The following table, extracted from the Daily Weather Reports, shows clearly that the nights of August 5th and 6th were very warm over the whole of England, and that the 5th was the warmer. The reading at Liverpool, the nearest station to Garstang, on 6th (64°) is very accordant with the 65° at Bruna Croft, and proves the accuracy of Mr. Wilson's instruments and observations.

The temperatures for the warmer night are given in Roman, for the cooler in italic, type.

Minimum Temperatures in England and Wales, August 5th & 6th, 1897.

	5th.	6th.		5th.	6th.
	°	°		°	°
North Shields	59	*58*	Oxford	*57*	59
York	*59*	60	London, Brixton	62	*61*
Spurn Head	61	61	North Foreland	*64*	66
Liverpool, Bidston	64	*59*	Dungeness	63	*60*
Holyhead	61	*59*	Hurst Castle	67	*64*
Loughborough	59	*58*	Prawle Point	60	60
Yarmouth	62	62			
Cambridge	58	58	Mean	61·1	60·3
Pembroke, St. Ann's Head	60	60			

NOTES OF DAMAGE BY RAIN AND THUNDERSTORMS, EXTRACTED FROM THE NEWSPAPER PRESS.

Monday, August 2nd.

Aberdeenshire.—Severe H storm, doing damage in the parishes of Premnay, Leslie, Keig, Tullynessle and Forbes, comparable to that of the storm in Essex on June 24th, the damage being estimated at more than £2,000. Almost every window facing N. or W. was broken.

Thursday, August 5th.

Herts.—At Tring Agricultural Society's Show a young man and woman sheltering under a tree were killed by L.

Royston.—Cellars were flooded and poultry drowned, and H stones fell, breaking glass in greenhouses.

Northamptonshire.—The thatched roof of Horspool Farm, Draughton, was fired by L, and the building was destroyed all but the walls.

At Raunds a tree was struck, and at Hargrave trees were struck and a cow was killed.

Hayricks were ignited at Draughton, and heavy H fell.

Huntingdon.—A labourer working in a field at Godmanchester had his left arm struck by L, and had to be removed in a cart.

Rutland.—L struck a house in Braunston Road, Oakham, passed down a chimney, and moved the fire-grate to the centre of the room.

Leicestershire—At Market Harborough the basements of several houses were flooded.

Derbyshire.—Fletcher's Lace Factory, Osmaston Road, Derby, was struck by L, and the roof much damaged.

Lancashire.—At Liverpool H as large as marbles fell, and at Herculaneum graving dock a man was killed.

St. Helen's.—In 45 minutes 2·28 in. of R fell.

Ramsbottom, near Bury. —A young man named Booth was struck and killed.

Large H fell at Heywood, and a farm house and dwelling were struck by L. A telegraph pole also was struck, and a passing horse bolted, the two occupants of the carriage being thrown out and injured.

Rochdale.—Many buildings flooded, and much damage at Horse Carrs Mills, Shawclough.

At Ashworth a farmer was injured, and at Whitworth a quarryman was killed.

Feniscowles, near Blackburn.—A farmer of Leyland was found dead in the road, having been struck by L while driving a trap.

At Chatburn a farmer was struck while in a field and killed instantly. A barn in the same neighbourhood was fired.

SUNDAY, AUGUST 8TH.

Norfolk, Lynn.—A tremendous, and most acceptable, downpour of rain occurred, falling in torrents for two hours in the afternoon, and houses in some parts of the town, especially in the neighbourhood of Windsor Road and Lower Canada, became flooded, some of them to a depth of two feet, in consequence of the sewers being unable to carry off the surplus waters. The tide in the river Ouse, into which the sewers discharge, was high at the time, and consequently the outlets were blocked, hence the mischief.

The rain gauge at the Manure works in Wisbeach Road, recorded 3·48 in. between 9 a.m. on Saturday and 9 a.m. on Monday.

Worcestershire.—At the Waterworks, Worcester, 1·46 in. of R fell, and the cellars of several houses in the low lying parts of the city were flooded.

Droitwich.—A heavy downpour of rain commenced at 8.30 a.m., and continued without intermission till mid-day. High Street was flooded for a length of 50 yards, and many persons had to take refuge in the upper floors of their dwellings. The steam fire engine was employed from 1.30 p.m. to 7.30 p.m., pumping the water from the roadway.

A portion of the embankment of the L. & N.W.R. between Spon Lane and Smethwick was washed away. The G.W.R. at West Bromwich was flooded, the water being three feet deep between the Trinity Road and Spon Lane bridges.

WEDNESDAY, AUGUST 11TH.

Dumfriesshire.—A shepherd was killed by L between Holmshaw and Earlshaugh, in Upper Annandale.

Edinburgh.—About midday, an electric lamp was struck by L at North Bridge, Edinburgh.

Lanark.—Between 4 p.m. and 5 p.m. a house in Barrfield Terrace, Uddingston, was struck, and a tree had its bark stripped off.

Ayrshire.—At Bogside, near Ayr, a brood mare was killed, the tail and hind quarters being scorched.

Saltcoats.—In Quay Street, at the Braes, in Green Street and Vernon Street, houses were flooded.

Dumbartonshire.—The cutting at Dalmuir on the North British Railway, was flooded, and traffic had to be stopped. All the low lying lands were flooded, and much damage was done to the crops. At Dumbarton East Station the water inundated the booking office, and at Burnside and in Bruce Street several houses were flooded.

Vale of Leven.—L struck a gas pipe at Renton Church, ignited the gas and set fire to the flooring.

Stirlingshire.—Water ran down the streets from the higher parts of Stirling like so many streams. At the foot of King Street serious flooding took place.

Kinrossshire.—Three cows were killed at Goudierannet, and twenty sheep at Thomanean. Three ricks were fired in the county. The rain was mixed with H and large pieces of ice, and much damage was done by flooding. Kinross High Street was covered in parts to a depth of several feet, and houses were flooded.

Fife.—Dunfermline. Great darkness, some H and torrents of R for half an hour. At the junction of Bridge Street and Chalmers Street the sewer was unable to carry off the water, which found its way into cellars and shops. At Low Beveridgewell a culvert burst, flooding Harriebrae Mills. At Pilmuir Street houses were flooded to a depth of two feet. At Townhill a house and several trees were struck by L.

Perth.—A cow was killed at Kippenross Park, Dunblane; a tree was struck and telephone wires were broken.

SUNDAY, AUGUST 15TH.

Banff.—The house 30, Market Street, Macduff, was struck by L, the current passed down a vent, and the grate was torn out and dashed six feet across the room.

TUESDAY, AUGUST 17TH.

Selkirk.—In the Yarrow valley and St. Mary's Loch district the rainstorm was exceptionally heavy. The hill burns in the valley and in Moffatdale came down like cataracts, and between St. Mary's Loch and Moffat the coaches had to traverse stretches of water, at some places three feet deep. The Yarrow and Ettrick were in heavy flood, and a bridge over Summerhope Burn, near Rodono Cottage, was swept away, rendering the road to Tibbie Shiel's impassable. Flooding took place at Chapelhope farm, and the road between this place and Oxcleuch was blocked, the burn bringing down with it tons of gravel and refuse. A bridge near the Grey Mare's Tail is also reported to have been swept away. In Moffat district about four o'clock there was an abnormal downpour, which resembled the bursting of a waterspout, and which lasted about twenty minutes. The river Annan rose rapidly, submerging holms below the town, and at the bridge near the railway station the volume of water filled the arch, and fears were entertained for the safety of the structure.

WEDNESDAY, AUGUST 18TH.

Bucks.—A bullock grazing in a field at Taplow was struck by L.

Warwick.—A chimney at 52, Darwin Street, Birmingham, was struck and fell through the roof, causing considerable injury. A building on Alcester Road, also was struck.

Glamorgan,—At Gendros, near Cockett, Swansea, five persons were assembled in a house, when it was struck by L; they were all thrown to the ground, a young woman had her face scorched, and a youth was burnt about the body.

THURSDAY, AUGUST 19TH.

Essex.—At Great Braxted, near Witham, a man named Crisp, was ploughing with two horses, when both man and team were struck dead by the L.

Kent.—Two cottages at Borden were struck by L and burnt down, and the inmates had to escape in their nightclothes. At Sittingbourne three houses were wrecked by L, and at Murston a barn was destroyed and a horse killed.

The steam trawler Strathisla, off Wick, had the foremast repeatedly struck by L, and splintered in several places. One compass was rendered useless and the other seriously affected. The mate was stunned by the L.

ELECTRICAL MANIFESTATIONS (?)

The following letter, extracted from the *English Mechanic* of August 20th, 1897, which differs in several particulars from the usual descriptions of ball lightning, at once recalled to our memory a very similar phenomenon, described by Mr. H. S. Eaton, at the meeting of the Royal Meteorological Society, on June 15th, 1887, of which we append an abstract. Other accounts of somewhat similar phenomena will be found in the *Quar. Jour. Roy. Met. Soc.*, XIII. (1887), p. 306.

Lightning Phenomena.—[40200.]—A few days since we had a very heavy thunderstorm. Immediately following one of the earliest flashes of lightning three people in my house saw, at the distance apparently of some 400 yards, a number of globes of fire (about twenty or so) rolling down a precipitous scar on the other side of this valley. These balls or globes appeared to follow each other at very brief intervals; probably several seconds passed from the first to last. Ball lightning has been observed about here during severe storms from time to time, though seldom: but I have never witnessed during a long sojourn, nor do I hear of anyone having seen before, anything at all approaching the phenomenon described. I shall be glad if any of your readers can explain, or to hear if anyone has seen a similar thing.

Aug. 14. C. F. R.

Note on a Display of Globular Lightning at Ringstead Bay, Dorset, on August 17th, 1876. By Mr. H. S. EATON, M.A., F.R.Met.Soc. Between 4 and 5 p.m. two ladies who were out on the cliff, saw, surrounding them on all sides, and extending from a few inches above the surface to two or three feet overhead, numerous globes of light, the size of billiard balls, which were moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding the grasp; now gliding slowly upwards two or three feet, and as slowly falling again, resembling in their movements soap bubbles floating in the air. The balls were all aglow, but not dazzling, with a soft, superb iridescence, rich and warm of hue, and each of variable tints, their charming colours heightening the extreme beauty of the scene. The subdued magnificence of this fascinating spectacle is described as baffling description. Their numbers were continually fluctuating; at times thousands of them enveloped the observers, and a few minutes afterwards the numbers would dwindle to perhaps as few as twenty, but soon they would be swarming again, as numerous as ever. Not the slightest noise accompanied the display.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	61·7	23	26·8	30	52·3	39·2	39·6	81	101·9	20·5	3·42	17	6·6
Malta	79·2	29	44·1	9	64·1	51·5	49·3	79	155·2	41·0	·75	7	4·5
Mauritius	86·0	5, 8	66·1	17	83·9	72·3	67·9	74	135·0	59·6	·88	10	6·0
Calcutta	98·9	10	63·9	13	89·9	70·6	64·2	61	154·0	56·9	1·37	3	2·9
Bombay	86·0	28	66·1	1	84·3	71·2	68·2	73	135·5	58·1	·00	0	1·0
Ceylon, Colombo	93·2	2	73·6	15	90·0	76·5	73·3	76	147·0	68·0	3·66	13	3·2
Melbourne	89·6	13	38·9	20	69·9	51·2	48·8	67	139·9	28·9	1·49	10	6·3
Adelaide	95·5	28	47·9	25	76·8	57·8	50·1	56	156·8	36·7	·58	10	5·8
Sydney	92·9	14	51·8	11	74·6	61·0	57·6	72	145·3	44·8	3·34	17	4·3
Wellington	75·5	15	41·7	31	66·2	53·5	49·4	69	133·0	33·0	2·06	16	4·5
Auckland	79·0	20	49·0	27	71·4	57·0	55·1	72	145·0	45·0	3·29	12	4·8
Jamaica, Kingston	91·3	17	65·1	12	86·4	69·6	66·5	70	...	...	·13	1	3·3
Trinidad	89·0	10*a*	64·0	23	86·7	68·8	75·2	77	164·0	63·0	3·96	13	...
Grenada	89·8	28	70·0	2	86·3	72·8	77·7	75	155·0	...	6·04	15	5·8
Toronto	53·0	30	1·8	1	38·5	24·6	25·7	74	71·0	—2·2	2·97	15	6·0
New Brunswick, Fredericton	46·9	31	—14·3	1	34·3	15·4	18·8	63	...	...	4·53	17	6·1
Manitoba, Winnipeg	51·9	31	—33·7	15	23·8	—1·5	...	...	...	...	1·58	9	...
British Columbia, Esquimalt	53·1	25	27·7	10	44·5	32·5	34·0	86	...	...	4·64	20	7·2

a—and 16, 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·6, or 0°·9 above the average. Mean hourly velocity of wind 11·8 miles. TS on 8th. L on 4 days. Average temp. of sea 60°·8.
J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1, of dew point 1°·9, and rainfall 7·28 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·1 above the average; extremes 23·1 on 22nd and 1·8 on 11th; prevailing direction E.S.E. T on 2nd, L on 3rd, and T and L on 4th. Rainfall ·88 in., against an average for 23 years of 8·16 in, being the least in March during the period 1875-97. T. F. CLAXTON.

CEYLON, COLOMBO.—TS8 occurred on the 27th, 29th, and 30th. L was seen on 8 days. H. O'HARNARD.

Adelaide.—Mean temp. 3°·2 below the average for 40 years. The coldest March, with one exception (1885), in the 40 years. Rainfall ·50 in. below average.
C. TODD, F.R.S.

Sydney.—Temp. 1°·5 below, rainfall 2·04 in. below, and humidity 4·5 below, their respective averages. Severe drought over fully half of New South Wales, the other part having good rains. H. C. RUSSELL, F.R.S.

Wellington.—Up to the 20th generally fine with occasional showers, wind chiefly S.E. and N.W.; the latter part of the month showery. Five days of strong N.W. wind. Slight earthshake on 20th. Temp. 2°·3 below, and R 1·48 in. below, their respective averages. R. B. GORE.

Auckland.—Rather wet and stormy during most of the month. The rainfall being almost an inch above the average. Mean temp. close to the average; barometric pressure much below. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the Island gives a better result than the two preceeding months, being about two-thirds of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 2·09 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·34	XI.	Rhayader, Nantgwillt ...	6·04
II.	Dorking, Abinger Hall .	3·81	,,	Lake Vyrnwy	6·29
,,	Birchington, Thor	2·27	,,	Corwen, Rhug	3·97
,,	Hailsham	3·94	,,	Criccieth, Talarvor	4·46
,,	Ryde, Thornbrough	4·22	,,	I. of Man, Douglas	3·90
,,	Emsworth, Redlands ...	4·19	XII.	Stoneykirk, Ardwell Ho.	5·52
,,	Alton, Ashdell	4·43	,,	New Galloway, Glenlee	7·89
III.	Oxford, Magdalen Col..	3·55	,,	Moniavie, Maxwelton Ho.	7·22
,,	Banbury, Bloxham	3·93	,,	Lilliesleaf, Riddell	3·95
,,	Northampton, Sedgebrook	4·79	XIII.	N. Esk Res. [Penicuick]	4·05
,,	Duddington [Stamford].	3·00	XIV.	Glasgow, Queen's Park..	5·51
,,	Alconbury	2·92	XV.	Inverary, Newtown	8·14
,,	Wisbech, Bank House...	3·07	,,	Oban, The Corran	...
IV.	Southend	2·25	,,	Islay, Gruinart School ...	2·63
,,	Harlow, Sheering..... ...	3·98	XVI.	Dollar.....	6·17
,,	Colchester, Lexden	2·04	,,	Balquhidder, Stronvar...	11·93
,,	Rendlesham Hall	1·95	,,	Ballinluig	6·55
,,	Rushall Vicarage	3·17	,,	Dalnaspidal H.R.S.....	9·56
,,	Swaffham	3·12	XVII.	Keith H.R.S.....	3·45
V.	Salisbury, Alderbury ...	2·74	,,	Forres H.R.S.	2·49
,,	Bishop's Cannings	4·82	XVIII.	Fearn, Lower Pitkerrie..	2·16
,,	Blandford, Whatcombe .	3·50	,,	N. Uist, Loch Maddy ...	3·95
,,	Ashburton, Holne Vic...	7·83	,,	Invergarry.....	3·43
,,	Okehampton, Oaklands.	7·37	,,	Aviemore H.R.S.	3·03
,,	Hartland Abbey	5·00	,,	Loch Ness, Drumnadrochit	2·82
,,	Lynmouth, Glenthorne.	4·88	XIX.	Invershin	1·84
,,	Probus, Lamellyn	4·09	,,	Scourie	...
,,	Wellington, The Avenue	4·18	,,	Watten H.R.S.....	2·63
,,	Wincanton.....	4·71	XX.	Dunmanway, Coolkelure	9·32
VI.	Clifton, Pembroke Road	6·37	,,	Cork, Wellesley Terrace	4·33
,,	Ross, The Graig	3·92	,,	Killarney, Woodlawn ...	7·95
,,	Wem, Clive Vicarage ...	3·08	,,	Caher, Duneske	5·10
,,	Cheadle, The Heath Ho.	4·52	,,	Ballingarry, Hazelfort...	4·63
,,	Worcester, Diglis Lock	4·55	,,	Limerick, Kilcornan ...	4·51
,,	Coventry, Priory Row ..	3·97	,,	Broadford, Hurdlestown	5·84
VII.	Grantham, Stainby	3·72	,,	Miltown Malbay	7·05
,,	Horncastle, Bucknall ...	3·34	XXI.	Gorey, Courtown House	4·99
,,	Worksop, Hodsck Priory	2·16	,,	Athlone, Twyford	5·55
VIII.	Neston, Hinderton	2·80	,,	Mullingar, Belvedere ...	6·51
,,	Southport, Hesketh Park	3·26	,,	Longford, Currygrane...	5·72
,,	Broughton-in-Furness ...	7·09	XXII.	Woodlawn	7·08
IX.	Ripon, Mickley.....	3·31	,,	Crossmolina, Enniscoe ..	7·30
,,	Melmerby, Baldersby ...	...	,,	Collooney, Markree Obs.	6·23
,,	Scarborough, Observat'y	3·58	,,	Ballinamore, Lawderdale	6·74
,,	Middleton, Mickleton ...	4·43	XXIII.	Warrenpoint.....	5·66
X.	Haltwhistle, Unthank...	3·82	,,	Seaforde..	4·64
,,	Bamburgh	2·27	,,	Belfast, Springfield	5·44
,,	Keswick, The Bank.....	8·92	,,	Bushmills, Dunlarave..	4·73
XI.	Llanfrechfa Grange	8·22	,,	Stewartstown	5·15
,,	Llandovery	6·80	,,	Killybegs	6·87
,,	Castle Malgwyn	4·59	,,	Lough Swilly, Carrablagh	4·11
,,	Builth, Abergwesyn Vic.	7·57			

AUGUST, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours Dpth	Greatest Fall in 24 hours Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date	No. Nights below 32 In shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	2·92	+ 1·04	·76	8	16	88·4	5	48·1	13	0
II.		Tenterden	3·23	+ 1·37	·62	26	18	85·0	4	50·0	12*c*	0
,,		Strathfieldsaye	3·54	...	·75	31	17	...	...	...	...	...
III.		Hitchin	2·07	+ ·25	·39	30	15	85·0	4, 5	47·0	12	0
,,		Winslow (Addington)	5·68	+ 3·71	1·04	24	21	87·0	4, 5	47·0	13	0
IV.		Bury St. Edmunds (Westley)	4·76	+ 2·56	1·88	25	16	79·0	5	49·0	26	0
,,		Norwich (Brundall)	1·27	...	·27	8	15	84·0	4	46·0	26	0
V.		Weymouth (Langton Herring)	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	3·31	...	·54	30	20	72·1	5	49·5	27	0
,,		Polapit Tamar [Launceston]..	5·85	+ 3·37	·90	30	26	79·7	3	46·8	27	0
VI.		Stroud (Upfield)	5·59	+ 3·50	·98	30	24	85·0	4	51·0	28	0
,,		ChurchStretton (Woolstaston)	3·32	+ ·56	·42	7, 18	20	82·0	4	46·0	27	0
,,		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	3·34	...	·77	30	21	88·0	5	42·0	3*d*	0
,,		Boston	2·27	+ ·15	·80	8	15	90·0	4	42·0	26	0
,,		Hesley Hall [Tickhill].....	2·43	+ ·27	·65	30	18	90·0	5	43·0	3	0
VIII.		Manchester (Plymouth Grove)	4·04	+ ·95	·90	6	23	89·0	4	42·0	29	0
IX.		Wetherby (Ribston Hall) ..	3·52	+ 1·18	·71	24	19	...	...	...	...	...
,,		Skipton (Arncliffe)	8·78	+ 4·45	2·75	5	22	...	...	...	...	...
,,		Hull (Pearson Park).	2·79	+ ·15	·87	26	15	81·0	5	45·0	3	0
X.		Newcastle (Town Moor)	2·87	+ ·16	·62	24	17	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	17·38	+ 8·93	2·42	13	24	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	7·97	+ 4·36	1·17	30	21	...	...	...	...	...
,,		Haverfordwest	6·15	+ 2·97	·64	23	22	80·8	3	44·0	27	0
,,		Aberystwith (Gogerddan) ...	3·82	...	·44	7	21	86·0	3	38·0	9*e*	0
,,		Llandudno.....	3·03	+ ·67	·70	10	21	85·0	3	51·2	29	0
XII.	SCOTLAND.	Cargen [Dumfries]	5·66	+ 2·67	·68	29	21	82·0	3, 4	42·0	19	0
XIII.		Edinburgh (Blacket Place)...	4·24	...	·99	4	19	78·1	21	48·6	19	0
XIV.		Colmonell	6·21	...	1·10	29	21	87·0	3	44·0	18	0
XV.		Lochgilphead (Kilmory).....	5·51	+ ·95	·62	29	20	...	...	47·0	9*f*	0
,,		Mull (Quinish).....	4·12	— ·03	·62	16	21	...	...	...	...	...
XVI.		Loch Leven Sluices.....	4·60	+ 1·66	1·00	12	14	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·25	+ ·68	·45	13	22	79·6	7	43·8	19	0
XVII.		Braemar	5·06	+ 1·73	·66	28	25	76·3	1	37·2	19	0
,,		Aberdeen (Cranford)	3·07	...	·83	11	20	74·0	4	43·0	21*g*	0
,,		Cawdor (Budgate)	2·43	+ ·18	·55	11	18	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·98	— ·32	·54	14	11	...	...	...	...	...
,,		Glencarron Lodge.....	5·15	...	·72	17*a*	21	78·0	5	41·0	22	0
XIX.		Dunrobin	2·57	+ ·17	·44	11	15	68·0	2, 5	44·0	23	0
,,		S. Ronaldsay (Roeberry).....	2·32	— ·24	·58	11	17	70·0	4	47·0	22*h*	0
XX.	IRELAND.	Darrynane Abbey.....	5·73	...	·60	29	27	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·45	+ 2·03	·76	23	23	79·0	2	43·0	20	0
,,		O'Briensbridge (Ross)	5·56	...	·62	7	25	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	5·74	+ 2·77	·77	20	22	...	...	...	...	...
,,		Dublin (Fitz William Square)	3·79	+ 1·27	·90	7	23	76·8	4	49·2	19	0
XXII.		Ballinasloe	7·00	+ 3·82	1·13	29	24	74·0	2, 3	48·0	23	0
,,		Clifden (Kylemore)	14·46	...	1·90	30	25	...	...	...	...	...
XXIII		Waringstown	4·79	+ 1·68	·98	29	18	82·0	1	40·0	10	0
,,		Londonderry (Creggan Res.).	4·15	+ ·03	·49	10	25	...	...	...	...	...
,,		Omagh (Edenfel)	6·11	+ 2·62	1·10	10*b*	21	78·0	1	45·0	9	0

+Shows that the fall was above the average ; —that it was below it.

a—and 20. *b*—and 29. *c*—and 13, 16, 26. *d*—and 26, 29. *e*—and 22, 24. *f*—and 18, 21, 2
g—and 31. *h*—and 23.

METEOROLOGICAL NOTES ON AUGUST, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm: R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Hot and dry at first, showers in third week were helpful to grass and hops, but prevented completion of harvest, which was still further delayed by heavier rains towards the end of the month. Sunshine 225 hours 40 mins., or more than 50 per cent. above last year. Mean max. temp. 2° higher, and min., both in screen and on grass, 5° higher. Min. on 5th 63°. TS on 8th from 4 to 5 p.m., and on 19th, 3 to 4 a.m. TSS around on 25th, sharp at 1 to 1.30 p.m.

ADDINGTON.—The greatest August rainfall during the last 27 years. The month began with a high max. temp., lasting until the 5th, on which day a heavy TS passed over us; a fine young cedar of Lebanon on the lawn and close to the Manor was split by L from top to bottom. The remainder of the month was very unsettled. On the 30th, at 5 p.m., a heavy downpour of rain gave ·20 in. in ten minutes. Dense fog on the morning of the 25th.

BURY ST. EDMUNDS, WESTLEY.—The wettest August I have recorded during the last 40 years. The nearest to it was 1881 with 4·73 in. Nevertheless most of the corn is well harvested. On the 25th we had a very heavy TS with much H, which did great damage to the mangolds and turnips, but it did not extend over a large area. The month has been hot, the max. temp. has not been below 63°. TSS on the 5th, 18th and 25th; distant T on 13th and 19th.

NORWICH, BRUNDALL.—Mean temp. 63·4, being the highest in any August since 1893, and in any month, with that exception, since July, 1887. The rainfall was, in this neighbourhood, very partial, and we still felt the effects of the drought at the end of the month. Out of the 15 days on which rain was recorded, 12 gave less than a tenth of an inch. At the Norwich Cemetery the total was 2·15 in. against our 1·27 in. T and L on 5th, 19th, 22nd and 31st. T on 8th, 18th and 28th. L on 24th. TSS on 25th at 10.30 a.m., at 2 and 4 p.m. Solar halo on 26th, p.m.

POLAPIT TAMAR.—A wet month, the total exceeding double the average. The total for the first eight months of the year is 26·86 in. as against 12·92 in. for the corresponding period in 1896, *i.e.*, more than twice as much. The first few days of the month were very seasonable, hot and dry, but the last were very wet and stormy.

STROUD, UPFIELD.—TS on 6th, about 5 p.m., from S.W., ·23 in. of rain fell. Small TS on 18th, from 5.30 to 6.30 p.m., ·50 in. of R falling, and heavy TS to the N. and S. of us. T on 5th, 8th, 23rd, and L and T on 31st from 11 a.m. to noon.

WOOLSTASTON.—The first week was very hot and sultry, but after a heavy storm of T and L on the 6th the weather broke up, and the temp. fell considerably, R falling nearly every day for the rest of the month.

ROTHERBY HALL.—The weather during the first fortnight in August was very hot, and the rain which fell after the 18th was very acceptable, following the almost continuous dry weather of the previous eight weeks. There was T on seven days during the month, with no fewer than five TSS on the 24th. The rainfall was ·88 in. above the average for 1880-9. Exactly 15 inches fell here during the first eight months of 1897, against 12·58 in. for the same period of 1896. Mean shade temp. 61°.

SKIPTON, ARNCLIFFE.—A very wet month, the record of the 5th being the highest which has been recorded on one day for many years. The TS on the 5th very severe. Two cattle were killed, and three ash trees struck. Can any of your readers tell us why ash trees are more frequently struck than others?

WALES.

HAVERFORDWEST.—The first five days of August were very fine, and great heat prevailed, with a very large share of sunlight hastening the ripening of

the corn. The weather changed on the 6th, and very heavy showers fell (principally at night) and in a very short time, at 1.30 a.m. on the 8th, ·33 in. fell in 35 minutes, and this was not a solitary instance. This kind of weather continued for several days. The weather improved a little after the 17th, although showery; the 19th very fine and breezy, but R fell heavily at night, three-tenths in 25 minutes. From that date to the end of the month, with an occasional fine day, the weather became worse and worse up to the end; the excessive R, coupled with the high night temp., is causing much anxiety about the harvest, which, but for this disastrous weather, would have been a very good one. In August, 1879, 7·59 in. fell, since that period we have had nothing to equal 1897.

ABERYSTWITH, GOGERDDAN.—Very showery after the first week.

SCOTLAND.

CARGEN [DUMFRIES].—The favourable weather experienced in July continued only during the first four days of this month. Upon the 3rd and 4th the thermometer reached 82°, the highest point registered during the summer; on the 5th there was a sudden fall of temp., and R was registered on every day, except six, during the remainder of the month. The readings of the bar. never exceeded 30 in. after the 4th, and the mean bar. pressure has only once been lower since observations were commenced at this station in 1860. The mean temp. 59°·8 is 1°·5 higher than the average for August, and has only once, in 1893, been higher since 1880; during the first nine days the mean reading exceeded 65°, from 10th to 31st it was only 57°·6. The rainfall is very considerably above the average, and has only been greater in six during the last 38 years. The weather has proved disastrous to the corn crop, hardly a stack having been as yet secured. Turnips are showing signs of a singular disease, taking the form of a rot in the upper portion of the bulb, no doubt occasioned by the constant wet weather following an unusually vigorous growth in the early stages of the crop. Potatoe disease is also prevalent. T and L at 7 p.m. on 4th, and all day 5th. T at 11 p.m. on 14th, and on 25th.

EDINBURGH, BLACKET PLACE.—A sunny, warm and wet month. Mean pressure ·178 in. below, temp. 2°·6 above average. R ·76 in. above mean. Bright sunshine 181 hours, and only one sunless day. First 12 days very hot, mean temp. 63°·6. Severe TSS on 4th, 5th, 6th, and 7th.

COLMONELL.—R 2·21 in., and mean temp. 2°·5 above, the average of 21 years. T and L on 4th, and T on 14th and 24th.

MULL, QUINISH.—The weather broke up on the 13th, and until the end of month has been very unsettled, with wind continually from S. and S.W.

BRAEMAR.—A very broken, unsettled month.

ABERDEEN, CRANFORD.—Strong winds from 12th to 20th, and little sun.

S. RONALDSAY, ROEBERRY.—Very fine, slight TSS on the 2nd and 17th.

IRELAND.

O'BRIENSBRIDGE, ROSS.—Great injury to corn, hay and potatoes by constant R.

DUBLIN, FITZ WILLIAM SQUARE.—A changeable, showery, windy month, but tolerably warm, in fact, great heat prevailed during the first week, which was in all respects summerlike. Mean temp. 60°·8, or 1·1 above the average. High winds were noted on 16 days. T on 14th. L and T on the 18th.

EDENFEL.—The warm summerlike period which commenced on the 9th of July, and was only broken during that month for a short spell in its fourth week, continued with but little intermission until the 9th of August, and it would in consequence be difficult to exaggerate the resulting abundance and luxuriance of all vegetation. But from the 10th of August to the end there was nothing but rainy, unsettled, and more or less tempestuous weather, continuing through the first week of September, so that potatoes, cereals and the ungathered hay are all in serious danger. The rainfall of the year to 31st August 33·27 in. is 10·76 in. above the average, and far in excess of the record for any similar period during the past 33 years.

Now Ready. 52 Pages. Price One Shilling.

Including Portrait and other Illustrations.

The Great Meteoric Shower of November.

By W. F. DENNING, F.R.A.S.

The work describes the history of Leonid showers in past years, and refers to the various theoretical developments of meteoric astronomy, with particular reference to this system. The conditions affecting the brilliant showers expected in the few ensuing years are pointed out, and a large amount of information is given as to the most suitable method of observing the meteors. The various features of the display requiring further elucidation are specified, and numbers of interesting facts collected together as a guide and memorandum of reference for all intending observers of the coming phenomena.

TAYLOR & FRANCIS,

Red Lion Court, Fleet Street, London;

Or may be had of the Author, 102, City Road, Bristol.

THE OBSERVATORY

A Monthly Review of Astronomy.

Edited by H. H. TURNER, M.A., B.Sc., Sec. R.A.S.
(Savilian Professor of Astronomy,)

T. LEWIS, F.R.A.S., and H. P. HOLLIS, B.A., F.R.A.

Contains full Reports of the Meetings of the Royal Astronomical and Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young*, in "*Ten Years' progress in Astronomy.*"

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers)

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXI.] OCTOBER, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

WEATHER MAPS AND EARLY SYNCHRONOUS METEOROLOGICAL OBSERVATIONS.

IN the United States *Monthly Weather Review* for May, 1897, there appears a letter of unique interest with respect to the above-mentioned subjects.

Prof. Henry, the Secretary of the Smithsonian Institution, being anxious to organise a meteorological service in the United States, wrote on June 5th, 1850, to Mr. Glaisher, enquiring what was being done in this country. Mr. Glaisher wrote a long reply, and that reply has been found among the Smithsonian archives by Prof. Cleveland Abbe, and printed in the above-mentioned *Weather Review*.

As we have here Mr. Glaisher's own statement at the very time when the work was being arranged, the letter is so important that we reprint it *verbatim*, and will add a few comments at the end.

MY DEAR SIR,—In reply to your letter of June 5 I beg to say that I shall have great pleasure in sending you copies of the forms I use in collecting meteorological observations, and the results of my experience are entirely at your service. In your letter you have not indicated the channel through which you wish the papers to be sent, and, therefore, I shall forward them through the Royal Society.

With the papers I shall send you will find a few copies of an address of a new Society, which myself with a few gentlemen have formed. It is under the presidency of S. C. Whitbread, Esq.

At the meeting of the council of this Society, held a few days since, I did myself the pleasure of reading the letter with which you have favored me, and it was resolved that a form for collecting observations, drawn up by myself, and now in the printer's hands, should be sent to you, and the council expressed a wish to co-operate with the Smithsonian Institution as far as possible. Hitherto, there has been no fund devoted to meteorology in England, and I have borne all the expenses, excepting that each gentleman has furnished himself with his instruments; government, however, has published the results in the reports of the Registrar General, some of which I send.

We hope now to collect much more information than I have hitherto done, and if the system adopted by you be similar to that adopted by us, their united results will be more valuable.

Among the forms sent you will find one very simple, and which is used daily at about 50 different railway stations at the hour of 9 a.m., Greenwich time. The different railway companies have agreed that the station masters shall take these observations, and that they shall be brought to London the same day, free of expense. The proprietors of a London newspaper, the *Daily News*, incur the expense of sending a messenger to the several railway termini at about 2 a.m., and all the returns thus collected are immediately printed, so that the weather of the day previous, at one time, all over the country and parts of Scotland are publicly known. On receiving the paper I lay all these returns on a map, using a long, narrow-headed arrow to indicate the direction of the wind, and other symbols for the other information, and thus daily I know the weather, direction of the wind, etc., the whole being exhibited to the eye. Several gentlemen, whose names you will see in a form headed "Simultaneous observations taken at 9 a.m.," have agreed to co-operate with me, and to take all the observations taken by the railway station masters, as well as others, with their full sets of instruments. It is believed by these arrangements, that very important information, with respect to the passage of storms in particular, will thus be collected. I have already more than one year's observations and daily maps in an unbroken series.

Previous to commencing these observations I visited every station, determined its meridian, fixed a compass card, and instructed the station master, remaining with him till I felt certain he would take the observations well.

The method I have adopted with respect to the observations of general phenomena is first to superintend the making of the instruments, then their selection. I determine their index errors by carefully examining and comparing every instrument with a standard. I visit the different locations in which they are placed, and examine the positions of the instruments themselves.

On receiving the returns I first examine every one by itself; second, I divide them into groups, including the observations from one known good observer, and then I compare every result in every return with the corresponding result in the standard return, taking into account difference of elevation, etc.; next, I form groups according to latitude, and another according to the longitude, by these means I usually detect any errors, and I believe very few escape. After this I proceed to their combinations, etc.

The British Meteorological Society intends in future having monthly returns, including every observation, and for which a form is now being set up, I shall, therefore, be more certain of the accuracy of the results.

I should be glad to have some arrangements made with the captains of steam vessels between America and England, thus connecting the observations taken in both countries, and I think this may ultimately be done.

I have the honour to be, Sir, with much respect and esteem,

Yours very truly,

JAMES GLAISHER.

13, *Dartmouth Terrace, Blackheath, Kent, July 8th*, 1850.

The sudden advent of a forgotten document like this, naturally induces reference to previous statements respecting the matters therein mentioned. The first paper with which comparison has to

be made is Mr. Symons's *History of English Meteorological Societies*;(1) in it no modification whatever is needed.

The next papers are, "*The first Daily Weather Map, sold in the Great Exhibition of* 1851;(2) "*The First Daily Weather Map*;(3) *Scientific Weather Forecasting.* (4) Here Mr. Glaisher's letter gives additional information, showing, as it does, that the first reports were not (as we supposed) telegraphed, but were sent by train. With that exception, there seems nothing in either article which requires modification; but perhaps it will tend to clearness if we state, in chronological order, the facts as regards the British Isles:—

1848.—In the latter part of this year, or the early part of 1849, Mr. Glaisher received from nearly all the railway companies a free pass over their lines. He provided himself with a supply of compass cards, and travelled over the country, teaching the railway clerks how to observe the weather. At the same time he visited many private observers and inspected their stations, because from the beginning of 1847 he had organized and contributed to the Registrar General's Reports the series of tables which he has continued to furnish for every subsequent quarter for fifty years!

With regard to this inspection of stations—Is there any record of its (1) proposal or (2) execution at an earlier date?

1849, June 14th.—First collection of reports from the railway termini by the *Daily News*, insertion in its issue of the weather table for the previous day at 13 stations, and preparation by Mr. Glaisher in MS. of the first current weather map.

1851.—Similar information collected by the Electric Telegraph Company, and on August 8th issue of the first printed Daily Weather Map.

1860, September 6th.—Issue, by Admiral FitzRoy, of first Daily Weather Report at the cost of the English Government.

1872, March 11th.—Issue of first Daily Weather Map at the cost of the English Government.

The letter is very remarkable considering its date—before Maury, and *a fortiori* before the Brussels Conference, or the appointment of FitzRoy, or Le Verrier's action in consequence of the Black Sea storm. One cannot help regretting that lack of funds prevented England from reaping the advantage of Mr. Glaisher's broad and correct views, and that we are therefore ten or twenty years behind where we might have been. But as regards Mr. Glaisher personally—the Nestor of meteorologists, as Prof. Abbe happily names him—it must be some little consolation to know that his early efforts are thoroughly appreciated on both sides of the Atlantic.

(1) *Quar. Jour.* [*Roy.*] *Met. Soc.*, Vol. VII. (1881), pp. 65–98.
(2) *Met. Mag.*, XXXI. (1896), p. 113.
(3) *Met. Mag.*, XXXII. (1897), p. 33.
(4) *Science Progress, N.S.*, I. (1896), p. 1.

TRUE TIME.

WE have received, and reprint at once, the following circular. But for the signature, and for the fact that we can remember no table or book which gives the information desired, we should not have believed it possible that there was any difficulty in knowing, in London, what time was being indicated by the office clock of any telegraph station in the world. However, this information appears not to be forthcoming, and as Prof. Milne requires to be able to identify with certainty seismometric and telegraph cable disturbances all the world over, we are sure that his enquiry should receive all assistance possible. We are glad to hear that the Marquess of Salisbury has promised to forward some of the applications through the Foreign Office, so that they may receive proper attention. Possibly this revelation of ignorance may be one step onward towards the attainment of that evident *desideratum*, Universal Time.

BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

SIR,—It is, I think, remarkable that there appears to be no publication which shows the corresponding value in Greenwich Mean Time, of the local time employed throughout the World.

Such a table is indispensable in order to determine accurately the instant of occurrence of earthquakes, sea waves, magnetic phenomena, the despatch of telegrams, and many other events, the sequence of which in absolute time has to be determined.

Although application has been made to the Royal Observatory at Greenwich, to the Royal Geographical Society, to the Central Telegraph Office in London, to the Offices of Cable Companies, and to other possible sources of information, very little has been obtained.

As a Secretary of the British Association Committee whose names are appended, I desire to publish in their forthcoming report a table showing the differences between Greenwich mean time as used in England and Scotland and that of the Civil Times used in various parts of the world.

By Civil Time I mean the time used by Railways, Telegraphs, and for ordinary public affairs.

If different times are used in various parts of your country, I trust that you will be able to give information relating to the same.

Feeling assured of the value of the table it is intended to compile, I sincerely trust that you will favour me with a full and explicit statement of the time generally employed in your country. If it is mean time, state the meridian; the observatory, or the place to which this refers; and also, as a check against any misunderstanding, please state distinctly the equivalent of December 1st, 9 a.m. G.M.T. in the local time, or times adopted in your own country.

I have the honour to remain, sir,
Your obedient servant,
JOHN MILNE.

SEISMOLOGICAL INVESTIGATION COMMITTEE.

BRITISH ASSOCIATION.

LORD KELVIN, F.R.S.
Dr. J. T. BOTTOMLEY, F.R.S.
Professor G. H. DARWIN, F.R.S.
Major L. DARWIN.
G. F. DEACON.
Professor C. G. KNOTT.
Professor R. MELDOLA, F.R.S.
Professor J. PERRY, F.R.S.
Dr. ISAAC ROBERTS, F.R.S.
Professor W. G. ADAMS, F.R.S.
Sir F. J. BRAMWELL, Bart., F.R.S.
HORACE DARWIN.
Dr. C. DAVISON, *Secretary.*
Professor J. A. EWING, F.R.S.
Professor G. A. LEBOUR.
J. MILNE, F.R.S., *Secretary.*
Professor J. H. POYNTING, F.R.S.
G. J. SYMONS, F.R.S., *Chairman.*

SUNLESS DAYS AND THE DAY-DISTRIBUTION OF SUNSHINE IN SUMMER.

How many sunless days have we in London in the year, the months, the seasons? I will try to answer this question, on the basis of twenty years' observations at Greenwich (1877-96).

By a "sunless day" is to be understood one giving no record in the Campbell-Stokes instrument, in which, as is known, a strip of millboard is charred by solar rays focussed by means of a glass globe.

The total of sunless days in those twenty years I find to be 1,849; giving an average of (say) 92 in a year. About one-fourth of our days are sunless. In winter, of course, there is a large preponderance. The monthly averages are as follows:

Jan.	17·9	April.....	3·7	July.....	1·7	Oct.	8·5
Feb.....	11·3	May.....	2·5	Aug.....	2·1	Nov.....	12·9
March	5·9	June.....	2·6	Sept.....	3·6	Dec.....	19·3

Thus, December has most, and July least. (It may here be noted that the month with most bright sunshine is May.) Spring has 12·1 sunless days; summer, 6·4; autumn, 25·0; winter, 48·5. In the series, summer, spring, autumn, winter, each of the last three has about twice as many sunless days as the season before it.

Consider next the numbers in years and half-years:—

	Sunless days in year.	Sunless days Apl.—Sep.	Sunless days Oct.—Mar.
1877.....	86	16	—
1878.....	84	7	67
1879.....	106	17	85
1880.....	78	14	67
1881.....	92	17	80
1882.....	84	9	69
1883.....	82	20	67
1884.....	92	18	71
1885.....	102	15	74
1886.....	104	19	93
1887.....	92	17	78
1888.....	98	23	83
1889.....	105	19	70
1890.....	97	14	81
1891.....	79	18	79
1892.....	98	14	71
1893.....	80	10	80
1894.....	97	27	64
1895.....	90	13	73
1896.....	103	22	86
Totals	1849	329	1438

The year with most sunless days in this period is 1879, then follow 1889, 1886, 1896, &c. On the other hand, 1880 comes lowest, then 1891, 1893, &c. The most sunless summer half is 1894; the most sunless winter half, 1885-86.

Let us now restrict our attention to the five months May to September, and consider how the 153 days of this period are to be distributed in respect of bright sunshine. The total days in those 20 summer seasons (3,060) are arranged in grades differing by one hour's bright sunshine (0 to 1, 1 to 2, &c., each grade including the lower, but not the upper limiting value). Thus we have the following table:—

Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.	Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.
0—1	609	30·4	9—10	167	8·3
1—2	258	12·9	10—11	147	7·3
2—3	261	13·0	11—12	115	5·7
3—4	225	11·2	12—13	100	5·0
4—5	253	12·6	13—14	76	3·8
5—6	221	11·0	14—15	8	·4
6—7	233	11·6	15—16	1	—
7—8	204	10·2			
8—9	182	9·1	Total	3060	(say) 153

It will be seen that the grade 0 to 1 stands high above the others. About 20 per cent. of those days have sunshine less than one hour, or none. On the other hand, about 14 per cent. have 10 hours, or more. There are eight cases (in those 20 years) of 14 to 15 hours' sunshine, and there is one (in 1887) over 15.

A. B. M.

SO-CALLED SULPHUR-RAINS.

AMONG the superstitions engendered by ignorance of the laws of meteorology we must include the "showers of sulphur." Without absolutely denying that the wind may be able to carry to great distances real sulphur coming from volcanoes, it is certain that the majority of such showers are due to quite another cause. At Bordeaux the phenomenon of the so-called sulphur shower is quite frequent; it is seen every year in April and May, chiefly with fine rain and west winds. Objects are covered by this rain with a very fine yellow powder, which collects in hollow places. This powder has no odour and is impalpable; but if it be examined with the microscope it may be shown to consist of kidney-shaped bodies swelled at both extremities. The origin of this yellow powder is not doubtful. Bordeaux is encompassed toward the south and west by vast pine forests. At the period of flowering the pollen is carried by the wind up to the clouds, whence it falls with the rain. The special form of the corpuscles collected is absolutely identical with that of grains of vegetable pollen.—*Revue Scientific.*

HIGH TEMPERATURE AT NIGHT, AUG. 4TH.

To the Editor of the Meteorological Magazine.

SIR,—Your *Met. Mag.* for September to hand. I can confirm the fact of the high night temperature. Here at the altitude of 1,148 ft., as in England, the highest minima occurred during the two nights of 4th to 6th of August: 4th-5th, 61°·4; 5th-6th, 61°·5.

They occur in the first decade of August, of which the daily mean temperature is 65°·8; whilst that of the third decade of July is 63°·7, and that of the second decade of August, 62°·6.

But these high minima fall far short of those of other years, as you may judge from my table of 12 years' observations:—

DATE.	Maximum of the day before.	Minimum.	Lowest Minimum in between.
	°	°	°
1886 July 20	87·1	66·4	46·9
1886 Aug. 30	74·5	66·4	
1887 July 30	85·5	66·2	48·0
1887 Aug. 6	83·7	65·7	
1888 July 22	73·8	60·8	46·0
1888 Aug. 10	80·8	69·6	
1889 July 10	83·1	63·0	46·9
1889 Aug. 4	76·1	59·7	
1890 July 31	80·1	64·6	50·9
1890 Aug. 9	77·2	61·0	
1891 July 17	72·3	58·6	46·4
1891 Aug. 14	71·1	60·1	
1892 July 30	80·4	61·3	45·7
1892 Aug. 17	90·9	72·1	
1893 July 20	77·4	61·5	46·4
1893 Aug. 16	83·1	68·4	
1894 July 23	81·7	65·1	46·9
1894 Aug. 24	72·7	62·6	
1895 July 25	78·1	66·6	48·7
1895 Aug. 21	81·0	66·2	
1896 July 20	76·1	62·1	45·3
1896 Aug. 15	71·2	54·7	
1897 July 24	74·5	59·7	50·7
1897 Aug. 5	81·7	61·5	

You will notice that the difference between the minimum and the maximum of the day before is very variable, from 20°·7 in July, 1886, to 8°·1 in August, 1886. I have even seen this difference to be only 1°·8 in the middle of summer: on August 23rd, 1894, the maximum was 62°·6, and the minimum of the next day, 60°·8.—Yours truly,

V. RAULIN.

Montfauçon (Meuse), Sept. 18th, 1897.

To the Editor of the Meteorological Magazine.

SIR,—Referring to the letter in your last issue by Mr. Sydney Wilson, and to your list of high minimum temperatures, I may add

that the minimum reading on August 5th at Malvern, 500 ft. above sea level, was 68°·6. The maximum of the 4th being 83°·6. The minimum readings throughout the month were so high, that it brought the mean to within 1°·7 of that of July, although the latter month was upon the whole far hotter.—Yours faithfully,

C. S. PRINGLE.

Weston-super-Mare, 18th Sept., 1897.

A THERMO-HYGROGRAPH-CARRYING KITE 10,016 FT. ABOVE SEA LEVEL.

WE have not been able to keep our readers fully informed as to the progress of kite work in the United States. Suffice it now to say that Mr. A. Lawrence Rotch has invoked the aid of a small steam engine to wind in his kites, and has sent us the cutting which we reprint below; and we think that in so doing we ought to congratulate him on his success in the experiment; as to that of the prediction, we know nothing:—

"BLUE HILL OBSERVATORY, Sept. 19th.—All kite records were broken here this afternoon when the topmost kite of seven, all of the Hargrave type, on four miles of wire, attained an altitude of 10,016 feet above the sea level, or 9386 feet above the summit of the hill.

"The first kites were sent up about noon, and the greatest height was reached at 4.17 p.m., but several of the kites were in the air for an hour after sunset.

"The day was particularly favourable for the flight, the air being clear, while at the surface the wind blew in strong puffs from the south. As the kites rose, however, they ran into a more westerly current, until just after the last one was sent up, the highest was almost at right angles to the lowest, causing the wire to make a long sweeping curve to the eastward.

"As usual, an aluminium box containing an instrument for recording pressure, temperature and humidity, was swung 130 feet below the topmost kite. It remained higher than a mile during five hours.

"At the highest point the thermometer recorded a temperature of 38°, while at the same time it was 63° at the surface of the earth.

"At a height of 4000 feet the relative humidity rose rapidly, but sank again at a mile, where it was quite low. At 7000 feet it again rose, and soon reached a point where there was almost complete saturation of the air. From there upwards the atmosphere became drier, until at the highest point there was scarcely any moisture recorded. At the ground the relative humidity all the afternoon was quite low.

"The entire flight was made without a mishap, the kites going up easily, and, after getting above the southerly wind, remaining very steady.

"It took the steam engine a little over two hours to reel in the four miles of wire, and the last kites reached the ground at 6.40 p.m.

"From observation obtained in the upper atmosphere it does not appear that any sudden change in the temperature is probable for a day or so, the decrease in the temperature with height being about the average."

TREES DAMAGED BY LIGHTNING.

DURING the TS in the N. of London on July 21st, a poplar in Clissold Park, Stoke Newington, was damaged in a rather unusual way. The tree, a large one, stood on the edge of a gravel walk; and a low (9 inch) rail of 1 inch iron, which divided the footpath from the adjoining grass (and which was supported for most of its length by dwarf iron posts) had been driven into the tree so as to support the extremity of the rail. There was, therefore, virtually a long horizontal conductor connected to earth at every 8 ft., ending in the tree. When the storm-cloud came near, there was an explosive discharge, *not* at the top of the tree, nor even at any of its branches, but from about six inches above where the rail entered, up to about 4 ft. 6 in. above the ground; there the outer rough bark was blown off for about 3 ft. high by 1 ft. broad; along the middle of this the inner soft bark had been grooved (as is often the case with poplars) and separated from the trunk of the tree. We did not see the tree for two days, and doubtless the edges had been touched, but we noticed one feature to which we desire to call special attention, so that others may see whether the fact we noticed is, or is not, exceptional. The frayed edges on one side of the groove were attached by their upper extremities, and those on the other side by their lower ones—not without exception, but probably six fragments out of seven followed this rule. Of course, this suggests the passage of two currents in opposite directions; we express no opinion, and make no assertions; we merely record what we saw, and ask all who see a tree which has been grooved by lightning, to examine the edges carefully, and report the result. It is, we think, not much use looking at oaks, as they seem to be generally burst asunder as by an internal explosion.

EXPERIMENTS TO DRIVE AWAY HAIL.

WE have heard often enough that loud and continued explosions produce rain, and the recollection of rain-making experiments based upon this apparent connection is still with us. Now comes a report from Mr. Germain, United States Consul at Zürich, on the prevention of hailstorms by the same means that have been used to encourage a downfall of rain. It appears that Mr. Albert Stiger, burgomaster of Windisch-Freistritz (Lower Steirmark, Austria), owns extensive vineyards situated on the southern slopes of the Bacher Mountains,

a locality often visited by destructive hailstorms. To protect his vines from hail, he decided to try the shooting or explosive system to scatter the clouds and drive away approaching hail or heavy rain storms. Six stations were therefore erected on the six most prominent summits surrounding the locality, and commanding a territory of about two miles in extent. These stations sheltered ten heavy mortars each. Upon the slightest indication of a storm the mortars were immediately manned and loaded with 120 grams of powder each—about 4¼ ounces—and shooting commenced simultaneously and continued regularly out of the sixty mortars until the clouds were scattered and the storm had blown over. These experiments were anxiously watched by the citizens of Windisch-Freistritz last summer. Threatening black clouds made their appearance over the summits of the Bacher Mountains; at a given signal all the mortars were fired off, and the continuous detonations in a few moments caused a sudden reaction in the movements of the clouds. It is said that the clouds opened up funnel-like, the mouth of the funnel began to rise in the form of consecutive rings, expanding gradually until all of the cloud scattered and entirely disappeared. There was no hail, or even a sudden downpour of rain. The same experience was gone through six times during the summer, and proved a successful preventive in each case. We await the views of Austrian meteorologists upon these experiments; meanwhile, rainmakers who have put their trust in explosions must hide their diminished heads before the rain-dispersers.—*Nature.*

SAND STORM ON THE NILE.

MERAWI, *Sept. 22nd.*

THE great heat of the last ten days, due to the prevalence of the south wind, culminated yesterday in a great storm. All the morning the sky had been unsettled, and finally the clouds gathered, the air became perfectly still, and the birds ceased singing. The heat was intolerable, it was impossible to remain in one's tent, and many of the force sought relief by bathing their heads in water.

Suddenly, about three o'clock in the afternoon, two distinct dust walls were seen approaching, one from the south and one from the east. At the same time the wind began sighing in the trees. In five minutes it had increased to a hurricane, the two walls of sand united, and came on straight towards the middle of the camp. The noise resembled the sound of a big drum, and this, together with the rushing wind, produced a tremendous and awe-inspiring roar. The sand made a peculiar sound, like the rending of cloth. For half-an-hour the storm continued with unabated fury. By the end of that time the eyes, nostrils and mouths of all in camp were full of sand. Tents were blown down, and the river was lashed into furious waves. So suffocating were the clouds of sand that in many cases acute nausea ensued, while everyone suffered extreme discomfort.

THE BRITISH ASSOCIATION AT TORONTO.

EVERYBODY has seen in the newspapers how heartily the British Association was welcomed in Britain beyond the Sea; we, therefore, need say nothing on that head.

As regards Meteorological papers and reports we have been favoured with some yards of newspaper cuttings, but we have not room to print them *in extenso*, and doubtless the important papers will be published in the volume of the Association, which we are glad to find is issued much more promptly than it used to be. In these circumstances, we think that the best plan is to quote the summary of the Meteorological work given by our American contemporary, *Science*.

In the meteorological department the following papers were read:—

John Hopkinson, "Monthly and Annual Rainfall at Ten Stations in the British Empire, 1877 to 1896." It appears doubtful, however, whether so limited a series of observations can be taken as representative of the pluviology of the Empire.

Dr. Van Rijckevorsel, on the "Temperature of Europe." From certain peculiar maxima and minima exhibited by the curves of daily temperature, he considers that the continent may be divided into two regions in which a different type of weather prevails.

Prof. R. F. Stupart (Director of the Meteorological Service of Canada), on the "Climatology of Canada."

F. Napier Denison on the "Great Lakes as a Sensitive Barometer." From a comparison of simultaneous records of changes of level in the Great Lakes and of smaller undulations in the atmospheric pressure by means of a sensitive barograph, the author concludes that the larger differences are due to difference of atmospheric pressure over the extremities of the lake, but may be greatly augmented by the action of the wind on the surface of the water. The smaller undulations appear to be due to atmospheric waves caused by currents in different strata travelling in opposite directions, as shown by Helmholtz.

Papers were also contributed by A. Lawrence Rotch and by Prof. Marvin, on the "Exploration of the Air by Kites," showing how it was possible, by means of recording instruments sent up to great elevations attached to a kite, to obtain information with regard to the temperature and hygrometric condition of the air, which would be of use in forecasting. It appears, however, that there is still much to be done in improving the recording hygrometer.

There seem to have been also the following other papers which (perhaps intentionally) the reporter for *Science* ignores; we add the titles without comment.

DR. J. EDKINS.—Slow Refrigeration of the Chinese Climate.

R. G. HALIBURTON.—November Meteors and November Flood Traditions.

DR. OTTO HUHN.—Meteorites, Solid and Gelatinous.

PROF. PERCIVAL LOWELL.—Atmosphere in its Effects on Astronomical Observation.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	67·3	27	27·8	11	55·3	39·6	89·9	78	108·9	20·7	1·57	16	6·9
Malta	78·8	24	47·0	3	66·6	54·8	51·5	77	146·2	44·0	1·85	9	5·3
Mauritius	84·5	1	64·2	17	81·7	69·9	64·9	72	130·5	56·0	1·75	14	5·3
Calcutta	103·7	17	67·6	4	97·2	75·0	67·0	57	159·6	59·0	·83	4	2·7
Bombay	93·5	27	71·0	4	88·7	77·6	73·9	74	141·5	61·2	·00	0	2·0
Ceylon, Colombo	92·2	...	71·2	9	89·5	75·9	74·5	81	146·0	70·0	10·97	17	5·5
Melbourne	84·4	17	37·6	23	68·5	48·5	48·2	68	133·5	25·0	·64	7	5·0
Adelaide	90·9	4	44·7	29	74·5	54·4	48·0	57	146·0	34·7	·93	8	4·3
Sydney	88·0	12	50·8	22	74·6	59·8	54·7	71	137·8	40·6	6·66	9	3·7
Wellington	67·5	5	40·0	24	61·5	50·5	48·0	74	130·0	29·0	6·92	12	4·5
Auckland	75·0	14	45·0	19	67·3	53·4	50·2	69	138·0	42·0	2·12	9	4·3
Jamaica, Kingston	89·5	12	69·8	27	86·9	72·1	68·6	70	...	...	2·00	7	1·6
Trinidad	94·0	28*a*	65·0	11	90·3	68·7	68·6	70	169·0	63·0	·26	4	...
Grenada	86·4	22	71·0	22	84·5	74·6	72·6	83	150·6	...	2·06	13	0·9
Toronto	71·1	23	29·9	20	51·2	34·7	34·9	70	85·5	15·0	2·14	14	6·7
New Brunswick, Fredericton	70·8	25	11·7	20	49·9	28·5	30·3	65	...	...	2·67	13	6·5
Manitoba, Winnipeg	71·6	17	11·0	19	51·0	28·4	...	...	...	...	1·01	10	5·7
British Columbia, Esquimalt	70·7	15	32·2	2	56·6	40·6	45·6	83	...	...	1·04	11	5·6

a—and 29.

REMARKS.

MALTA.—Adopted mean temp. 59°·3, or 0°·3 below the average. Mean hourly velocity of wind 13·2 miles. T8S on 3rd and 10th; L on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 3°·3, and rainfall 3·47 in., below their respective averages. Mean hourly velocity of wind 12·8 miles, or 2·3 above average; extremes, 30·6 on 6th, and 1·9 on 4th; prevailing direction E.S.E. L and T on 27th. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days. H. O. HARNARD.

Adelaide.—Mean temp. just the average of 40 years. This was another very dry month, the total rainfall being ·84 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall ·36 in. above, temp. 2°·3 above, and humidity 7·2 below, their respective averages. Mean temp. for the month the highest recorded since Sydney Observatory was built. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine up to the 13th, with occasional showers. Wind N.W. and frequently strong. The wind changed to S.E. on night of 14th, followed by heavy rain and strong S.E. wind on 15th and 16th; 3·06 in. and 3·04 in. of rain being recorded on the 16th and 17th, causing floods. Remainder of month fine. Mean temp. 1°·0 below, and rainfall 3·39 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually fine and calm month. Rainfall quite one inch below the average of 30 years; mean temperature slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the island shows a marked excess, and nearly every station had falls much in excess of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·77 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·11	XI.	Rhayader, Nantgwillt ...	6·26
II.	Dorking, Abinger Hall .	2·61	,,	Lake Vyrnwy	4·90
,,	Birchington, Thor	2·01	,,	Corwen, Rhug	...
,,	Hailsham	3·82	,,	Criccieth, Talarvor	4·10
,,	Ryde, Thornbrough	2·42	,,	I. of Man, Douglas	5·44
,,	Emsworth, Redlands ...	2·74	XII.	Stoneykirk, Ardwell Ho.	4·50
,,	Alton, Ashdell	2·53	,,	New Galloway, Glenlee	4·58
III.	Oxford, Magdalen Col..	2·21	,,	Moniavie, Maxwelton Ho.	3·91
,,	Banbury, Bloxham	1·97	,,	Lilliesleaf, Riddell	2·84
,,	Northampton, Sedgebrook	2·16	XIII.	N. Esk Res. [Penicuick]	3·05
,,	Duddington [Stamford].	2·71	XIV.	Glasgow, Queen's Park..	3·39
,,	Alconbury	2·81	XV.	Inverary, Newtown	6·10
,,	Wisbech, Bank House...	3·48	,,	Oban, The Corran	...
IV.	Southend	2·54	,,	Islay, Gruinart School ...	2·82
,,	Harlow, Sheering.....	3·50	XVI.	Dollar.....	3·47
,,	Colchester, Lexden	2·98	,,	Balquhidder, Stronvar...	5·49
,,	Rendlesham Hall	2·34	,,	Ballinluig	...
,,	Rushall Vicarage	3·69	,,	Dalnaspidal H.R.S.....	5·49
,,	Swaffham	4·03	XVII.	Keith H.R.S.....	3·46
V.	Salisbury, Alderbury ...	2·71	,,	Forres H.R.S.	1·99
,,	Bishop's Cannings	2·50	XVIII.	Fearn, Lower Pitkerrie..	1·16
,,	Blandford, Whatcombe .	2·96	,,	N. Uist, Loch Maddy ...	...
,,	Ashburton, Holne Vic...	4·77	,,	Invergarry.....	6·30
,,	Okehampton, Oaklands.	6·31	,,	Aviemore H.R.S.	2·91
,,	Hartland Abbey	5·15	,,	Loch Ness, Drumnadrochit	4·48
,,	Lynmouth, Glenthorne.	6·69	XIX.	Invershin	3·48
,,	Probus, Lamellyn	4·67	,,	Scourie	...
,,	Wellington, The Avenue	3·24	,,	Watten H.R.S.....	3·44
,,	Wincanton.....	4·12	XX.	Dunmanway, Coolkelure	4·45
VI.	Clifton, Pembroke Road	3·82	,,	Cork, Wellesley Terrace	2·02
,,	Ross, The Graig	2·60	,,	Killarney, Woodlawn ...	3·93
,,	Wem, Clive Vicarage ...	2·05	,,	Caher, Duneske	2·87
,,	Cheadle, The Heath Ho.	3·78	,,	Ballingarry, Hazelfort...	2·76
,,	Worcester, Diglis Lock	2·12	,,	Limerick, Kilcornan ...	3·14
,,	Coventry, Priory Row...	2·37	,,	Broadford, Hurdlestown	2·79
VII.	Grantham, Stainby	2·54	,,	Miltown Malbay	4·10
,,	Horncastle, Bucknall ...	2·43	XXI.	Gorey, Courtown House	2·50
,,	Worksop, Hodsck Priory	2·02	,,	Athlone, Twyford	2·03
VIII.	Neston, Hinderton	4·23	,,	Mullingar, Belvedere ...	2·54
,,	Southport, Hesketh Park	3·99	,,	Longford, Currygrane...	1·87
,,	Broughton-in-Furness ...	6·12	XXII.	Woodlawn	2·12
IX.	Ripon, Mickley.....	1·83	,,	Crossmolina, Enniscoe ..	3·02
,,	Melmerby, Baldersby ...	1·64	,,	Collooney, Markree Obs.	2·58
,,	Scarborough, Observat'y	3·09	,,	Ballinamore, Lawderdale	1·89
,,	Middleton, Mickleton ...	2·78	XXIII.	Warrenpoint.....	2·52
X.	Haltwhistle, Unthank...	...	,,	Seaforde.....	2·57
,,	Bamburgh	2·20	,,	Belfast, Springfield	2·92
,,	Keswick, The Bank.....	6·16	,,	Bushmills, Dundarave..	2·86
XI.	Llanfrechfa Grange	5·02	,,	Stewartstown	1·40
,,	Llandovery	4·99	,,	Killybegs	4·96
,,	Castle Malgwyn	4·81	,,	Lough Swilly, Carrablagh	4·14
,,	Builth, Abergwesyn Vic.	7·42			

SEPTEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. Sig. In shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	2·75	+ ·24	·68	29	13	70·6	29	38·1	19	0
II.		Tenterden ...	2·43	— ·48	·55	29	16	70·0	26	37·0	19	0
,,		Strathfieldsaye ...	1·32	...	·45	1	11	...	...	...	...	...
III.		Hitchin ...	1·90	— ·60	·49	1	13	67·0	11*a*	36·0	9	0
,,		Winslow (Addington) ...	3·33	+ ·66	1·99	29	13	68·0	2*a*	33·0	19	0
IV.		Bury St. Edmunds (Westley)	2·93	+ ·23	·73	29	14	65·0	26	38·0	19	0
,,		Norwich (Brundall) ...	3·94	...	·92	18	16	69·0	2	39·0	4	0
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	3·09	...	·84	8	15	66·5	21	42·0	19	0
,,		Polapit Tamar [Launceston]..	6·03	+ 2·32	1·38	8	20	68·5	14	36·8	12*e*	0
VI.		Stroud (Upfield) ...	2·69	— ·22	·77	29	14	67·0	15*b*	40·0	18	0
,,		ChurchStretton(Woolstaston)	2·49	— ·01	·48	5	17	68·0	28	38·0	10	0
,,		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·35	...	·45	5	22	66·0	12*c*	34·0	19	0
,,		Boston ...	3·12	+ ·35	1·08	29	12	70·0	12	34·0	19	0
,,		Hesley Hall [Tickhill]...	1·99	— ·17	·49	1	13	69·0	24	36·0	9, 12	0
VIII.		Manchester(PlymouthGrove)	4·01	+ ·54	·91	2	12	69·0	27	34·0	9, 18	0
IX.		Wetherby (Ribston Hall) ...	2·65	+ ·19	·45	1	14	...	...	...	...	...
,,		Skipton (Arncliffe) ...	6·42	+ 1·66	1·22	1	18	...	...	...	...	...
,,		Hull (Pearson Park).	3·21	+ ·77	·67	29	14	69·0	24	35·0	9	0
X.		Newcastle (Town Moor) ...	2·75	— ·03	·80	1	13	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	11·99	+ ·26	3·42	23	18	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	5·91	+ 2·17	1·37	29	13	...	...	...	...	...
,,		Haverfordwest ...	5·09	+ ·69	1·04	1	20	66·9	12	36·2	12	0
,,		Aberystwith (Gogerddan) ...	7·20	+ 2·93	1·25	4	19	67·0	27	28·0	9*f*	...
,,		Llandudno...	3·62	+ 1·40	1·00	1	17	66·2	14	39·0	10	0
XII.	SCOTLAND.	Cargen [Dumfries] ...	3·40	— ·16	·66	1	16	71·6	13	34·0	9	0
XIII.		Edinburgh (Blacket Place)...	1·64	...	·33	1	20	69·1	13	38·0	18*e*	0
XIV.		Colmonell ...	3·90	...	·90	1	17	72·0	13	30·0	9	...
XV.		Lochgilphead (Kilmory)...	6·30	+ 1·17	·90	16	19	...	...	35·0	7	0
,,		Mull (Quinish)...	5·84	+ ·81	1·18	3	22	...	...	...	...	...
XVI.		Loch Leven Sluices ...	3·00	+ ·21	·70	2	15	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·25	— 1·26	·25	1	17	70·4	12	35·3	7	0
XVII.		Braemar	1·78	— 1·08	·44	1	21	64·2	13	28·5	8	3
,,		Aberdeen (Cranford)	1·52	...	·43	29	22	71·0	12*d*	32·0	3	1
,,		Cawdor (Budgate) ...	2·49	— ·26	·39	1	25	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	5·42	+ 1·74	1·94	27	12	...	...	...	...	...
,,		Glencarron Lodge...	11·21	...	2·15	25	24	64·2	13	33·6	9	0
XIX.		Dunrobin ...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldsay (Roeberry)...	5·99	+ 3·33	2·25	29	24	60·0	14	41·0	17	0
XX.	IRELAND.	Darrynane Abbey...	2·99	...	·90	7	18	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·29	+ ·37	1·43	1	12	72·0	14	37·0	12	0
,,		O'Briensbridge (Ross) ...	3·31	...	·49	4	16	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	3·19	+ ·37	1·24	1	17	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·58	+ ·61	1·17	1	16	67·7	23	40·9	18	0
XXII.		Ballinasloe	2·15	— ·64	·56	4	18	65·0	13*d*	38·0	12	0
,,		Clifden (Kylemore)	5·44	...	1·56	4	18	...	...	...	...	...
XXIII		Waringstown ...	2·21	— ·95	·61	1	15	73·0	13	34·0	9	0
,,		Londonderry (Creggan Res.).	2·60	— 1·18	·30	4	24	...	...	...	...	...
,,		Omagh (Edenfel) ...	2·27	— 1·11	·47	5	21	66·0	13	35·0	9	0

+ Shows that the fall was above the average ; — that it was below it.

a—*and 13, 26.* *b*—and 27. *c*—and 26, 27. *d*—and 14. *e*—and 19. *f*—and 10, 11,

METEOROLOGICAL NOTES ON SEPTEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The 1st and 5th were rough and wet, and the 2nd, 4th, 19th, 23rd and 24th were also windy. Fine weather prevailed in the middle of the month and there were two or three lovely days towards the end. Duration of sunshine 140 hours. T on 17th; TS at night on 29th.

ADDINGTON.—A good deal of very fine weather during the month. Rather wet until the 5th, after that date very little R until the evening of the 29th, when a very heavy storm of R, T, and L occurred, 1·99 in. of R falling, mostly between 4 p.m. and 8.30 p.m. For a long time the lightning was almost continuous in the S.E. On 30th, the brook overflowed the meadows. A slight frost on the 19th blackened a few tender things in low situations. Fogs on 27th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A month of the usual September weather. Cold days from 17th to 20th, the max. temp. on 19th being only 49°. Heavy TS at night on 29th, with incessant L, and very high wind.

NORWICH, BRUNDALL.—Mean temp. 2° below, and R 1·28 in. above, the average, and ·31 in. in excess of September, 1896, but the number of rainy days was 16 against 21 in the previous year. S.W. gale on 2nd. L on 3rd and 29th. TS and H showers on 4th. T and L on 6th, T, L, and heavy R on 29th.

TORQUAY, CARY GREEN.—Rainfall ·70 in. above the average. Mean temp. 56°·1, or 1°·9 below the average. Duration of sunshine 156 hours 35 minutes, being 1 hour 15 minutes above the average; four sunless days.

POLAPIT TAMAR.—A very wet month, especially the first eight days; the first few days were also rather stormy. The middle and latter portions of the month were generally calm and fine. The total rainfall for the first nine months of the year exceeds the whole fall for the year 1896. T and H on 3rd.

WOOLSTASTON.—The early part of the month was cold and wet, the latter part warmer and more genial. Mean temp. 54°·9. Vivid L on 29th.

ROTHERBY HALL.—The weather during the month was mild, with a fair amount of sunshine, the R falling chiefly in the night. The little frost (the thermometer on the grass falling once to 23°) did only slight damage to the gardens. The rainfall was ·24 in. below the average for ten years, 1880-89. Mean. temp. in shade 52°.

HULL, PEARSON PARK.—TSS on 1st and 6th.

SEATHWAITE.—On 23rd and 24th, 4·86 in. of R fell, causing a flood on the latter date.

WALES.

HAVERFORDWEST.—There were 20 wet days this September, but it was neither so wet nor so stormy as last year, although during the first six days strong winds prevailed with low pressure, and much R. Between the 9th and 18th there was fine bright weather, with a great fall of night temp. from the 10th to the 13th, the grass readings on three nights being below 32°. The unusual number of rainy days seriously interfered with the late harvest, and it is feared that much corn has been spoiled.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, although on the whole not ungenial month. Barometrical pressure and hours of sunshine are both slightly above the average for 38 years. The mean temp. is 1°·9 below that average. In the first six days 1·84 in. of R fell, considerably more than half the total for the month. Seven exceptionally fine days, 7th—13th, were followed by broken weather during the remainder of the month, and although R was recorded on ten out of the remaining seventeen days, no heavy fall (except ·46 in. on 23rd) occurred, and sharp breezes, chiefly westerly, prevented very serious interference with harvest operations, which, except in the higher districts, were concluded before the end of the month. The grain crop proved fairly satisfactory.

COLMONELL.—R ·12 in. below, and mean temp. 1°·3 above, the average of 21 years.

ABERDEEN, CRANFORD.—A warm month, with light winds.

S. RONALDSAY, ROEBERRY.—A wet month. Mean temp. 50°·5, or 1°·1 below the average of 7 years.

IRELAND.

WATERFORD, BROOK LODGE.—Dense fog on 11th, thick fog on 15th, and fogs on 12th and 13th. T in the afternoon on 30th.

O'BRIENSBRIDGE, ROSS.—Moderate R and a fortnight of bright weather.

DUBLIN, FITZWILLIAM SQUARE.—The month began badly, but proved favourable after the first few days, which were cold and wet. The mean temp. 54°·5 is 1°·3 below the average. High winds were noted on 11 days, but attained the force of a gale only on the 23rd. The atmosphere was foggy on 6 days. H fell on 3 days. A solar halo was seen on the 7th.

WARINGSTOWN.—An unusual difference was observed between the minima in shade, and on grass, amounting on the night of the 7th, 8th, 10th, 11th, and 18th, to 10°, while on the night of the 9th the shade min. was 34°, and the grass min. 25°. French beans, and some other plants were injured, but dahlias and heliotrope did n ' suffer.

EDENFEL.—The weather of September, although on the whole fickle and uncertain, tended to retrieve the disaster that impended over the harvest generally, and it would be impossible to over estimate the value to the country of the fineness of the second and part of the last week. As a result an average crop of cereals was saved in fair order, and the deficiency of potatoes—very serious in some localities—has been to some extent compensated for by the abundance of other green crops and grass. Orchard fruit is the worst crop remembered.

BRITISH RAINFALL.

Subscriptions of £1 and upwards, or payments for publications to that amount, received from September 11th to November 13th:—

	£	s.	d.
Balfour, D., Esq., C.E.	1	0	0
Barton, W. C. V., Esq.	1	0	0
Carnegie, J., Esq.	2	10	0
Chichester, Major	1	0	0
Courthope, Col.	1	0	0
Danson, J. T., Esq.	1	1	0
Elmhirst, R., Esq.	1	0	0
Esdaile, C. E. J., Esq.	1	0	0
Farrer, Rt. Hon. Lord	2	2	0
Fellowes, G., Esq.	1	1	0
Hill, J. Hansford, Esq.	1	0	0
King, Major	2	0	0
Little, Mrs.	1	0	0
Newton, C. E., Esq., C.E.	1	1	0
Pearse, Rev. J. T.	1	0	0
Rankin, J., Esq., M.P.	1	1	0
Riley, Mrs. (2 years)	1	0	0
Rochfort, Mrs.	1	0	0
Retch, A. Lawrence, Esq.	1	5	0
Rudd, C. D., Esq.	1	0	0
St. Maur, Lord Percy	1	0	0
Somerset, His Grace the Duke of	1	0	0
Weston, J., Esq.	1	1	0

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory,"
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXII.] NOVEMBER, 1897. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE RAINFALL OF OCTOBER, 1897.

THE rainfall of October, 1897, has been so exceptionally small that we feel justified in devoting a considerable amount of space to a discussion of the details.

In table I. we have tabulated all records received up to date which show a total fall for the month of less than an inch. These number 61 out of a total of rather under 240, or fully one-quarter.

It will at once be seen that these stations are distributed over the S., S.E., E., and N.E. of England, stretching west as far as Torquay, and northwards to the borders of Yorkshire. Of course the adoption of an arbitrary limit of an inch is open to the objection that it does not represent a uniform ratio to the average, but on the other hand it represents a uniform quantity of water for the supply of springs and streams.

The main results of the table will perhaps be most readily grasped by summing the values for the different counties, as follows :—

					in.
Middlesex	5	stations	giving	a mean of	·73
Surrey	4	,,	,,	,,	·60
Kent	11	,,	,,	,,	·32
Sussex	10	,,	,,	,,	·34
Hants	6	,,	,,	,,	·49
Berks	1	,,	,,	,,	·70
Herts	3	,,	,,	,,	·69
Essex	5	,,	,,	,,	·51
Suffolk	3	,,	,,	,,	·59
Norfolk	5	,,	,,	,,	·88
Devon	1	,,	,,	,,	·94
Lincoln	3	,,	,,	,,	·82
Notts	2	,,	,,	,,	·98
Derby	2	,,	,,	,,	·96

It must be borne in mind that these figures do not represent the mean rainfall of the month over the different counties, but they probably indicate very fairly the relative intensity of the drought, and accepting the results we find the lowest values for the seaboard counties in the extreme S.E., Kent ·32 in., Sussex ·34 in., Hants ·49 in., Essex ·51 in., Suffolk ·59 in., while Surrey ·60 in. is much above the adjoining coast counties. Similarly Lincoln ·82 in. gives a lower value than Notts ·98 in., and Derby ·96 in., inland.

TABLE I.—*October Rainfalls of less than an inch.*

STATIONS.	October, 1897.	Previous driest October.		Duration of Record.	Other Octobers with less than 1·00 in.	
		Amount	Year.		Amount	Year.
	in.	in.		years.	in.	
I. London, Camden Square	·56	·80	1879	40	·99	1884
,, Willesden Green, Strode Road	·76	...	...	3		
,, Muswell Hill	·74	·77	1879	26		
,, Finchley, Etchingham Park	·69	1·24	1888	13		
,, Uxbridge, Harefield Park	·91	...	...	7		
II. Abinger Hall	·72	·85	1879	19		
,, Farnham, Great Down Seale	·58	...	...	8		
,, Reigate, Woodhatch Lodge	·52	1·08	1890	18		
,, Wallington	·58	1·16	1890	14		
,, Tenterden	·24	·82	1879	34		
,, Hythe	·33	·68	1866	33		
,, Folkestone, Cheriton Road	·22	...	...	6		
,, Tunbridge Wells, Camden Park	·32	1·40	1884	14		
,, Seven Oaks, Riverhead Vicarage	·24	·58	1884	33		
,, Birchington, Thor	·28	...	...	6		
,, Sheppey, Leysdown	·20	1·24	1890	13		
,, Bickley, Elmhurst	·41	..	...	1		
,, ,, The High Field	·37	1·04	1879	20		
,, Bromley, Widmore Road	·45	...	...	2		
,, Chislehurst, Southlaund	·44	...	...	4		
,, Chichester, Westgate	·50	·92	1879	66		
,, Steyning	·48	1·35	1890	30		
,, St. Leonard's, The Grove	·07	1·12	1879	21		
,, Hailsham	·30	·88	1879	25		
,, Isfield Place	·29	...	...	2		
,, Uckfield	·38	·77	1879	56		
,, Lindfield, Wood Knoll	·39	...	...	4		
,, Crowborough, The Observatory	·36	1·08	1879	27		
,, East Grinstead, Felbridge Place	·40	...	...	3		
,, Ticehurst	·20	1·19	1890	15		
,, Ryde, Thornbrough	·44	1·24	1890	16		
,, ,, St. John's Park	·43	..	...	5		
,, Emsworth, Redlands	·54	·99	1884	14		
,, Liss, Lingwood	·64	...	...	6		
,, Alton, Ashdell	·76	·86	1884	32		
,, Strathfieldsaye Gardens	·11	...	...	3		
,, Wantage, Letcombe Regis	·70	1·04	1879	21		
III. Broxbourne, Stafford House	·60	1·12	1884	18		
,, Great Berkhampstead, Rosebank	·86	1·15	1888	13		
,, Hitchin, Wratten	·62	·61	1879	48	·92 ·81 ·97 ·80	1861 1871 1876 1888
IV. Southend Water Works	·15	·89	1890	17		
,, Manor Park, Albany Road	·42	...	...	7		
,, Harlow, Sheering	·77	·85	1879	34	·96	1871
,, Colchester, Hill House, Lexden	·48	...	..	9		
,, Saffron Walden, Newport	·71	·64	1879	22	·95	1888
,, Ipswich, Bishop's Hill	·47	·67	1879	26	·96	1888
,, Rendlesham Hall	·46	·55	1879	19	·78	1888

TABLE I.—*October Rainfalls of less than an inch (continued).*

STATIONS.	October, 1897.	Previous driest October.		Duration of Record.	Other Octobers with less than 1·00 in.	
		Amount	Years.		Amount	Year.
	in.	in.		years.	in.	
IV. Bury St. Edmunds, Westley	·85	·36	1866	41	·53	1861
					·95	1871
					·81	1876
,, Harleston, Rushall Vicarage	·69	·91	1879	24	·98	1879
,, Wymondham	·91	...	...	9		
,, Denver	·88	·55	1888	13		
,, Norwich, Brundall	·94	...	...	5		
,, Swaffham	·99	1·00	1888	20		
V. Torquay, Cary Green	·94	...	...	6		
VII. Grantham, Stainby	·84	...	...	9		
,, Boston	·91	·48	1888	31	·71	1879
					·85	1890
,, Horncastle, Hemingby	·70	·67	1888	17		
,, Worksop, Hodsock Priory	·97	·64	1888	23	·84	1879
					·96	1879
,, Hesley Hall [Tickhill]	·99	·54	1888	23	·94	1884
					·86	1890
,, Derby, Midland Railway	·97	·60	1888	15		
,, Duffield	·95	...	...	3		

TABLE II.—*Rainfall of October*, 1897, *compared with that of the previous 25 or more Octobers.*

DIVISION AND STATION.	1897.	Average.		1897 Per cent. of average.	Number of previous Octobers with less than	
		Amount.	Years.		1·00 in.	1897.
	in.	in.				
I. Camden Square	·56	2·71	40	21	2	0
,, Muswell Hill	·74	3·06	26	24	1	0
II. Tenterden	·24	3·58	34	7	1	0
,, Hythe	·33	4·19	33	8	1	0
,, Seven Oaks	·24	3·52	33	7	1	0
,, Chichester	·50	3·65	44	14	1	0
,, Steyning	·48	4·26	30	11	0	0
,, Hailsham	·30	4·06	25	7	1	0
,, Uckfield	·38	4·00	56	9	1	0
,, Crowborough	·36	4·38	27	8	0	0
,, Alton	·76	3·71	32	21	1	0
III. Hitchin	·62	2·69	48	23	5	1
IV. Sheering	·77	2·71	34	28	2	0
,, Ipswich	·47	2·70	26	17	2	0
,, Westley	·85	2·63	41	32	5	3
VII. Boston	·91	2·57	31	36	3	3
MEAN	·53	3·40	35	16	1·7	0·4

TABLE III.—*Relation of the Rainfall of October*, 1897, *to the average*, 1880-89.

STATIONS.	1897.	Per cent. of average 1880-89.	STATIONS.	1897.	Per cent. of average 1880-89.
	in.			in.	
Middlesex—			*Cornwall*—		
Camden Square	·56	19	Probus	1·69	31
Muswell Hill	·74	24	Polapit Tamar	1·50	30
Surrey—			*Gloucester*—		
Abinger Hall	·72	19	Clifton	1·22	34
Reigate	·52	15	Lechlade	1·39	51
Kent—			Stroud	1·56	51
Tenterden	·24	6	Cheltenham	1·48	50
Hythe	·33	7	*Hereford*—		
Sevenoaks	·24	7	Ross	1·84	56
Sussex—			*Shropshire*—		
Chichester	·50	15	Woolstaston	1·10	29
Steyning	·48	11	*Stafford*—		
St. Leonards	·07	2	Cheadle	1·11	32
Hailsham	·30	7	*Worcester*—		
Hants—			Diglis Lock	1·72	61
Ryde	·44	11	Lincombe Lock	1·19	41
Alton	·76	21	*Warwick*—		
Herts—			Coventry	1·81	57
Kensworth	·89	26	*Leicester*—		
Hitchin	·62	20	Rotherby Hall	1·36	44
Buckinghamshire—			*Lincoln*—		
Addington	1·24	40	Boston	·91	29
Oxford—			Bucknall	·70	22
Oxford	1·32	47	*Notts*—		
Banbury	1·64	54	Hodsock Priory	·97	31
Northampton—			Hesley Hall	·99	32
Castle Ashby	1·43	47	*Derby*—		
Sedgebrook	1·41	46	Derby	·97	29
Cambridge—			*Cheshire*—		
Wisbech	1·12	35	Hinderton	1·39	42
Essex—			*Lancashire*—		
Sheering	·77	26	Manchester	1·76	52
Newport	·71	23	Southport	1·87	53
Suffolk—			*York*—		
Ipswich	·47	15	Ribston Hall	1·57	50
Rendlesham	·46	14	Arncliffe	2·97	49
Bury St. Edmunds	·85	26	Ripon	1·72	46
Norfolk—			Hull	1·37	37
Rushall Vicarage	·69	19	*Northumberland*—		
Swaffham	·99	29	Unthank Hall	1·72	48
Wilts—			Newcastle	1·22	39
Alderbury	1·56	48	*Cumberland*—		
Bishops Cannings	1·46	45	Seathwaite	8·72	82
Mildenhall	1·59	49	Keswick	4·34	78
Swindon	1·47	47	*Wales (inc. Monmouth)*—		
Dorset—			Llanfrechfa	1·72	41
Blandford	1·44	34	Cardiff, Ely	1·91	42
Devon—			Llandovery	2·18	44
Holne Vicarage	2·33	33	Haverfordwest	1·96	38
Druid House	2·28	36	Gogerddan	1·81	34
Oakhampton	1·63	28	Nantgwillt	2·17	33
Barnstaple	1·39	27	Llandudno	1·46	43
Lynmouth	1·06	18			

Of the 61 stations included in the table, no fewer than 40 have records extending over periods ranging between ten and sixty years, which gives good evidence for determining how far the returns for 1897 are unparalleled. Of these 40 stations, 31 show a wholly unprecedented value for October, 1897; while the remaining 9 stations show between them 17 precedents distributed over the following years:—

	1861.	1866.	1876.	1879.	1884.	1888.	1890.
	in.	in.	in.	in.	in.	in.	in.
III. Hitchin	...	...	...	·61	...	...	...
IV. Newport	...	...	...	·64	...	...	...
,, Westley	·53	·36	·81	...	...	...	...
,, Denver	...	...	...	...	...	·55	...
VII. Boston	...	...	...	·71	...	·48	·85
,, Hemingby	...	...	...	...	...	·67	...
,, Hodsock	...	...	...	·84	...	·64	...
,, Hesley	...	...	...	·96	·94	·54	·86
,, Derby	...	...	...	...	...	·60	...
Instances each year	1	1	1	5	1	6	2

Eleven out of these 17 precedents come from Div. VII., where the 1897 fall for the 9 stations in table I. averages ·90 in., and where obviously the drought was not intense. On the other hand, the following 9 long records show no October fall smaller than that of 1897.

I. Camden Square	40 years.	II. Steyning	30 years.
II. Tenterden	34 ,,	,, Uckfield	56 ,,
,, Hythe	33 ,,	,, Alton	32 ,,
,, Seven Oaks	33 ,,	IV. Sheering	34 ,,
,, Chichester	66 ,,		

The latter columns of the table show the driest October previously recorded at each station, the period over which each record extends, and all other Octobers in which the fall was less than an inch. These give one of the strongest illustrations of the very exceptional character of the drought, for while there are 27 entries below ·50 in. for October, 1897, there are only two instances for all the other Octobers in the table numbering, wet and dry included, nearly 1,000. Namely, ·36 in. at Bury St. Edmunds in 1866, and ·48 in. at Boston in 1888. It should be mentioned that to avoid burdening the table with unimportant figures the "previous driest" is not given for stations at which the record does not extend over ten years.

Table II. gives a summary of the results for stations at which the records extend over 25 or more years, and in addition the percentage which October, 1897, bears to the average of the whole period, the number of instances of less than an inch of rain in October at each station, and the instances of any other October drier than 1897. It shows that at six stations the 1897 fall is less than 10 per cent. of

the average; and at only three is above 25 per cent. The Kent stations average 7 per cent., and the Sussex stations average 10 per cent.

At only three stations out of the sixteen has the fall been less in any other October than in that of 1897, viz.:—

Hitchin.....	October, 1897	in. ·62	excelled in	48	years by	in. ·61	in	1879
Westley.....	,, ,,	·85	,, ,,	41	,, ,,	·53	,,	1861
						·36	,,	1866
						·81	,,	1876
Boston	,, ,,	·91	,, ,,	31	,, ,,	·71	,,	1879
						·48	,,	1888
						·85	,,	1890

At the first of these stations, Hitchin, in a period of nearly half-a-century, the 1897 fall has been once—shall we say equalled—while at the other two, Westley, near Bury St. Edmunds, and Boston, the 1897 falls are decidedly large, so that the amounts for the six Octobers with smaller falls are not so remarkable as dozens of the 1897 returns, only two of them being below half-an-inch. It would perhaps be difficult to justify the line of means at the bottom of table II., but it is a ready method of getting a gross value, and according to it the 1897 falls average 16 per cent. of the mean of 35 years, and the October fall will be less than an inch once in 21 years, while the 1897 value averages just over half-an-inch.

Table III. gives for 72 stations in England and Wales the rainfall of October, 1897, expressed as a percentage of the average for the month during the ten years 1880-89. It, like table I., emphasizes the fact that the deficiency was greatest in the extreme S.E., and greater on the S. and E. coasts than inland.

Taking the average of the records for each county, Kent heads the list with only 7 per cent. of the average, and Sussex follows with 9 per cent. Hampshire, Surrey and Suffolk show 16, 17 and 18 per cent. respectively. Middlesex 22, Herts 23, Essex 24, and Norfolk 24, complete the list of counties with less than a quarter of the average. Less than one third of the average fall is indicated for Lincoln 26 per cent., Devon 28, Shropshire 29, Derby 29, Cornwall 30, Stafford 32, and Nottingham 32. The counties recording from one-third to half the average are Dorset 34 per cent., Cambridge 35, Bucks 40, Cheshire 42, Leicester 44, Northumberland 44, York 45, Northampton 47, Wilts 47, Gloucester 47, and Oxford 50. Hereford, Worcester, Warwick, and Lancashire show values of from 50 to 60 per cent., while Cumberland foots the list with 80 per cent. A larger number of stations in each county would probably modify to some extent the foregoing values, but if they are plotted on a map it will be seen that they are much more accordant than might reasonably have been expected.

The Welsh stations give remarkably uniform results, ranging only from 33 per cent. of the average at Nantgwillt, Radnorshire, to 44 per cent. at Llandovery, Carmarthenshire, the average for all the stations in the Principality being 39 per cent.

The general distribution over the country will perhaps be most readily indicated by grouping the stations under the divisions used in *British Rainfall*, when we get the following results.

Division	I.	Middlesex	22	per cent.	of the	average	1880–89
,,	II.	South Eastern Counties....	11	,,	,,	,,	,,
,,	III.	South Midland ,, ...	39	,,	,,	,,	,,
,,	IV.	Eastern Counties.....	22	,,	,,	,,	,,
,,	V.	South Western Counties...	36	,,	,,	,,	,,
,,	VI.	West Midland ,, ...	46	,,	,,	,,	,,
,,	VII.	North ,, ,, ...	31	,,	,,	,,	,,
,,	VIII.	,, Western ,, ...	49	,,	,,	,,	,,
,,	IX.	Yorkshire	45	,,	,,	,,	,,
,,	X.	Northern Counties.....	62	,,	,,	,,	,,
,,	XI.	Monmouth and Wales.....	39	,,	,,	,,	,,

Again very accordant values, lowest in the S.E., very small in the E., small along the S., S.W., and N.E. coasts, and increasing N. Westwards, but with rather unduly high values for the west midland counties.

The rapid increase of the 1897 fall, with increased distance from the sea coast already referreed to, is very marked, and is well exhibited by the following :—

Coast Stations.			Inland Stations.	
County.	Station.	Per cent. of aver.	Station.	Per cent. of aver.
Hants.....	Ryde.....	11	Alton.....	21
Suffolk.....	Rendlesham....	14	Bury St. Edmunds.	26
Devon	Lynmouth.....	18	Oakhampton.....	28
Gloucester	Clifton.....	34	Lechlade.....	51
York.....	Hull.....	37	Arncliffe	49
Northumberland..	Newcastle	39	Unthank Hall	48

In Sussex the difference between Coast and Inland stations is marked by the rapid increase from E. to W.

AUSTRIAN HYDROGRAPHY.*

It is a very strong and remarkable statement to make, but, to the best of our belief, it is true, that no Government Department ever started so nearly perfect an organization as that presided over by K. K. Oberbaurath Ernst Lauda.

Generally, early publications are more or less of an experimenta character; and it is by degrees only that completeness is reached; but Herr Lauda's first volume will rank with, if not surpass, anything that we have ever seen for any country in the world. As for England, we have absolutely nothing to put beside these splendid Austrian volumes.

---

* Jahrbuch der K. K. hydrographischen Central-Bureau Jahrgang I.–III., 1893–95. Braumüller, Wien, 1895–97. 3 vols., large 4to, 562, 552, 1330 pages and numerous maps.

Beiträge zur Hydrographie Osterreichs 4to 68 pages, and atlas on the scale of $\frac{1}{750,000}$ (about 12 miles to an inch).

The last being by far the largest of the three annual volumes, and of course giving the latest details as to the organization, we will base our remarks upon it. It consists of fifteen parts issued in a portfolio. The first part is a general introduction, with a map (about 2 ft. by 1½ ft.) on the scale of 35 miles to an inch of the principal river basins, showing also isohyetal lines for each 200 mm. (8 inches) of annual rainfall in the year 1895. It deals exclusively with details of the organization, and gives lists of the localities at which the observations are made. There are 2261 rainfall stations, and 28 additional ones for recording the depth of snow; and there are 872 stations at which the level of the water in the rivers and streams is measured daily.

Parts I. to XIV. deal with the several principal watersheds. Each part is alike in treatment, and, as it might be imagined that Part I.—Das Donau-Gebeit (The Watershed of the Danube)—was exceptionally good, we take Part IV.—Das Drau-Gebiet, or, as Englishmen would call it "The Watershed of the Drave." [*Why* it is not the rule for all countries to accept the local orthography of place-names we know not. To us it seems very absurd to write Vienna when we mean Wien, or Londres when we mean London; but it will be put right some day.]

This Part (IV.) deals with an area of about 12,000 square miles (about twice the size of Wales) which is roughly accordant with the district of Carinthia, has the Carnic Alps for its S.W. boundary, and the towns of Klagenfurt and Graz near its centre.

In this area there are 111 rain gauge stations at the following altitudes above sea level:—

14	between	656	and	1312 ft.	14	between	3281	and	3937 ft.
27	,,	1312	,,	1969 ,,	7	,,	3937	,,	4593 ,,
27	,,	1969	,,	2625 ,,	4	,,	4593	,,	4921 ,,
16	,,	2625	,,	3281 ,,	2	,,	5906	,,	7218 ,,

The level of the water in the rivers was observed at 74 stations; temperature of water and of air at a few of them.

First in the part comes a list of the stations, with the latitude, longtitude, and altitude of each, and the observer's name and profession (mostly clergy or schoolmasters); then follow tables of the daily rainfall at each station, and various analyses, and a carefully prepared summary of them. The wettest station is Raibl (lat. 46° 30°, long. 13° 35 E., altitude 2461 ft.), where the total in 1895 was 90·83 in., which was about 5 inches above its average; but the most remarkable feature was the rain at that station on October 8th and 9th, 1895, viz., 5·91 and 7·37 (*i.e.*, 13·28 inches in two days). The editor throws no doubt upon the record, and we see that at many drier stations the fall was between 5 and 7 inches.

Of course, on turning to the latter portion of the work, where the daily height of the water in the rivers is given, we expected to find this enormous rainfall produce a marked effect; and so we do, rises of 5 to 10 ft. being reported at most stations.

These water levels are given in the same detail as the rainfall, and we are glad to note that many of the observers did not content themselves with their usual daily observation on the day of the flood (generally October 10th), but took extra readings so as to obtain the true maximum.

Lastly we must mention the exquisitely beautiful large-scale shaded rainfall map given in each part.

Although it occurs in another section (Part. IX.), we ought not to omit to mention the enormous rainfall in some parts of Dalmatia; we therefore give it in tabular form.

Place	Crkvice.	Jankov vrh.	Sa. Croce.	Goli vrh.	Jablanica gornja.
Latitude N.	42° 34′	42° 35′	42° 29′	42° 32′	43° 40′
Longtitude E. of Gr.	18° 38′	18° 40′	18° 42′	18° 44′	17° 46′
Altitude	3599 ft.	3343 ft.	558 ft.	4301 ft.	630 ft.
	in.	in.	in.	in.	in.
1895, January ...	52·09	16·42	16·50	8·35	15·75
February...	36·93	21·58	16·38	14·69	10·55
March	17·05	16·73	10·16	6·61	10·35
April	13·82	17·60	11·38	13·15	8·94
May	11·54	15·35	5·63	4·84	7·01
June.....	3·74	3·78	(*5·59*)	6·06	1·85
July	4·17	4·10	3·58	4·17	3·39
August.....	·98	·43	·39	·83	2·01
September.	·32	1·06	1·42	·51	2·12
October ...	21·10	(33·34)	16·61	29·61	15·28
November..	7·13	4·09	3·66	6·89	5·71
December..	39·92	41·07	16·54	9·61	15·43
Total for 1895 ...	208·79	(*175·55*)	(*107·84*)	105·32	98·39
,, ,, 1894 ...	109·34	...	58·27	80·28	52·84
,, ,, 1893 ...	159·26	131·93	80·00	108·39	(*62·37*)

NOTE.—Italic figures indicate results partly observed and partly computed.

It would require weeks of work to justify the expression of an opinion as to the accuracy of the thousands of figures in these volumes, but our impression is that the work is very good. We have noticed only two doubtful entries, both in the first year, 1893. On page 53 the daily rain record for the Schmelz Reservoir at Vienna on January 22nd is 3·2 mm; it probably should be 23·2 mm, as all the other stations near Vienna had between 15 and 27 mm. And on p. 373 of the same volume we think that the river level at Primiero on February 4th should have been −20, not −30; very probably the observer reported −30, but we do not believe it to be correct.

The whole work is so exceptionally good that we can suggest but few directions in which improvement seems desirable. We have seen no reference to the pattern of rain gauge used, to the height of

the funnels above the ground, or to the time of observation either of the rainfall or of the rivers. Details on these points are desirable.

There seems a little vagueness in the reference to average rainfall. The fall in the year 1895 is for several stations compared with the average, but we are not told of what years the average is computed, or whether it is of synchronous years at all stations.

It is perhaps not unreasonable to hope that a Bureau which is doing such splendid current work, and doing it so sumptuously, will before long take up the subject of old observations and give us an authoritative and exhaustive statement as to the rainfall of bygone years, so that we may have the best available information as to the secular variation of the fall of rain in the Austrian Empire.

There is no reference to the volume of water discharged by the rivers, or to the relation between it and the rainfall. Apparently the existing organization could give information of great importance as to the flow from large areas, and we hope that before long it will do so.

REVIEW.

The Great Meteoric Shower of November, by W. F. DENNING, F.R.A.S (Reprinted from The Observatory.) Taylor & Francis, Red Lion Court. 1897, 8vo. 52pp., 1 plate.

ALL who wish to know the history of the great meteor shower which (whatever it may be in the early hours of November 15th and 16th, 1897) will probably be grand on November 14th and 15th, 1898, should obtain this pamphlet.

Mr. Denning is a recognized leader in this class of work, and as such his words carry great weight. We see that on page 31 he says that one observer must have made a mistake when he said that "the largest of the 1866 shower was not twice the apparent brilliancy of Sirius"; but as Mr. Denning quotes without criticism somewhat similar statements by such authorities as Backhouse, Hind, and Baxendell, there is no need for us to do more than shrug our shoulders and leave Mr. Denning to believe in "half the size of the moon" if he likes. Those who saw the shower know that the startling feature was, not the magnitude of the individual meteors, but their great number.

The pamphlet would have been improved by an index or table of contents, and we see no reference to efforts to photograph the area surrounding the radiant, and very little respecting the curious and frequent appearance of end-on meteors, *i.e.*, those directed precisely towards the observer, who sees first a point of light which increases in magnitude, becoming hazy at the edges, and then suddenly dies out; but there is so much in the pamphlet that is useful and interesting that few will go without the best publication on the subject.

INCREASED CLOUDINESS OF MALTA.

To the Editor of the Meteorological Magazine.

SIR,—In the *Meteorological Magazine* for September last (p. 121), touching upon the increased cloudiness of Malta registered during the last five years, you ask whether the change may not be due to a change of observers. The same question occurred to me some time ago, and set me to hunt up our record to see whether the variation in readings was really due to a change in the weather. The result of my search completely vindicated the observers. It is quite true that changes of observer have taken place. Previous to the winter of 1890-91, the Rev. J. Scoles, S.J., took all the observations. Towards the end of 1890 I assisted him, taking the morning observations, whilst he took those in the evening. In September, 1893, the Rev. R. Stevenson, S.J., took all the observations, and has done so ever since. Numerous comparisons shewed that my estimate of cloud agreed with that of the Rev. J. Scoles, and that the Rev. R. Stevenson's agreed with mine. The change then has been one of weather, more or less coincident with a change of observer. The spring and summer months here are characterised by sunny blue skies and very little cloud. Most of our cloudiness occurs in the autumn and winter months. During these latter months, east and southerly winds (warm, with high dew point) bring, almost invariably, overcast skies. A high average dew point for these months may then be taken to indicate the prevalence of these winds, and consequently of cloudiness. [*e.g.* As I write, a mild "sirocco," or S.E. wind is blowing, temp. 69°·5, dew point 67°·8, and the sky is completely overcast]. The following table, drawn up from our record, shews that, during the last five years, the dew point for the autumn and winter months has been very notably higher than during the five years preceding.

MEAN DEW POINT.

	Five years (1887-91).	(1892-96).		Five years (1887-91).	(1892-96).
	°	°		°	°
January.....	45·4	45·0	October.....	60·4	62·8
February	45·1	47·7	November	53·6	55·3
September.....	65 3	66·0	December.....	48·8	49·1

As personal equation will not account for this remarkable rise in dew point, I think that this table shews that there was, in all probability, as much cloud in the sky as the observers estimated. Again, our record of wind direction is explicit as to the unusual prevalence of southerly winds (called here "Venti bassi") during the last, as contrasted with the preceding, five year period.

I am, yours sincerely,

J. F. DOBSON, S.J.

St. Ignatius' College, Malta, October 18th, 1897.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	78·0	18	33·9	13	63·7	43·2	41·1	67	124·7	27·1	1·08	9	4·8
Malta	79·3	30	50·1	17	70·7	58·0	55·1	76	150·9	45·5	1·41	8	5·3
Mauritius	82·5	20	57·4	21	78·5	66·7	61·6	71	127·6	49·1	·66	6	4·4
Calcutta	104·6	9	70·2	30	95·6	79·0	75·2	68	161·7	66·9	3·78	6	3·8
Bombay	93·3	28	77·8	2	90·7	80·7	76·3	74	146·7	70·7	·00	0	3·3
Ceylon, Colombo	92·2	5	75·0	26	89·7	79·7	75·6	80	143·0	73·0	8·30	19	6·8
Melbourne	70·9	12	33·5	21*c*	60·5	43·5	42·8	69	120·0	23·2	1·97	8	5·7
Adelaide	72·2	16	41·5	21	65·0	48·7	44·9	67	133·0	31·6	2·09	12	5·2
Sydney	...	...	...	...	...	...	...	..	...	...	...	...	...
Wellington	65·5	7	35·0	21*e*	60·4	47·8	44·8	70	114·0	23·0	1·97	11	4·1
Auckland	70·0	3	40·5	24	63·1	50·6	47·6	71	124·0	34·0	6·03	19	5·8
Jamaica, Kingston	90·4	8*a*	69·9	18	87·9	73·6	72·2	72	...	...	3·47	11	4·9
Trinidad	94·0	4*b*	68·0	4	91·0	72·0	71·9	74	173·0	66·0	5·58	14	...
Grenada	87·0	16	72·4	19*d*	84·7	74·8	70·6	75	148·0	...	5·88	25	2·0
Toronto	73·0	18	34·9	22	61·0	44·1	43·5	69	88·5	27·2	3·02	12	6·8
New Brunswick, Fredericton	74·3	14	28·5	9	61·1	40·3	40·6	69	...	...	6·54	18	7·2
Manitoba, Winnipeg	88·0	4	23·0	31	67·8	38·3	...	...	...	...	1·59	11	4·5
British Columbia, Esquimalt	83·4	28	39·2	2	63·1	45·2	46·7	81	...	...	·62	7	4·9

a—and 23. *b*—and 8, 11, 12, 13. *c*—and 22. *d*—and 26. *e*—and 30.

REMARKS.

MALTA.—Adopted mean temp. 62°·9, or 1°·2 below the average. Mean hourly velocity of wind 12 miles. Average sea temp. 66°·0. TS8 on 4th and 24th; L on 28th; H on 24th. Slight earthquake shocks on 27th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8, of dew point 2°·6, and rainfall 3·62 in., below their respective averages. Mean hourly velocity of wind 11·7 miles, or 1·5 above average; extremes, 28·1 on 29th, and 1·6 on 1st; prevailing direction E.S.E. Rainfall the least in May since 1875, excepting 1880, when ·49 in. fell. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 5 days. L on the 27th. R. V. ALLEN.

Adelaide.—Mean temp. 0°·8 below, and rainfall ·80 in. below, the average of 40 years. The drought appears to be gradually breaking up, fair rains having fallen over a large portion of the colony. C. TODD, F.R.S.

Wellington.—Generally fine weather, with occasional showers and variable winds, up to the 26th; showery for the remainder of the month. Strong winds on five days from W. and N.W. L on 30th; S on hills on 30th and 31st; H on 30th. Temp. 2°·1 above, and rainfall 2·91 in. below, the average. R. B. GORE.

Auckland.—A wet and stormy month, the rainfall being 1·75 in. over the average, and the highest recorded in May since 1883. Mean temperature slightly under the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Heaviest rainfall on 5th when 1·75 in. fell in 1 hr. 45 min., between 7 and 9 p.m. TS8 from the middle to the close of the month. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·93 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·91	XI.	Rhayader, Nantgwillt ...	2·17
II.	Dorking, Abinger Hall .	·72	,,	Lake Vyrnwy	1·80
,,	Birchington, Thor	·28	,,	Corwen, Rhug	1·34
,,	Hailsham	·30	,,	Criccieth, Talarvor	1·26
,,	Ryde, Thornbrough	·44	,,	I. of Man, Douglas	2·32
,,	Emsworth, Redlands ...	·54	XII.	Stoneykirk, Ardwell Ho.	2·44
,,	Alton, Ashdell	·76	,,	New Galloway, Glenlee	3·80
III.	Oxford, Magdalen Col..	1·32	,,	Moniavie, Maxwelton Ho.	3·12
,,	Banbury, Bloxham	1·64	,,	Lilliesleaf, Riddell	1·80
,,	Northampton, Sedgebrook	1·41	XIII.	N. Esk Res. [Penicuick]	1·85
,,	Duddington [Stamford].	1·05	XIV.	Glasgow, Queen's Park..	1·71
,,	Alconbury	1·01	XV.	Inverary, Newtown	4·93
,,	Wisbech, Bank House...	1·12	,,	Oban, The Corran	...
IV.	Southend	·15	,,	Islay, Gruinart School ...	1·73
,,	Harlow, Sheering..... ...	·77	XVI.	Dollar.....	1·45
,,	Colchester, Lexden	·48	,,	Balquhidder, Stronvar...	5·33
,,	Rendlesham Hall	·46	,,	Ballinluig	2·92
,,	Rushall Vicarage	·69	,,	Dalnaspidal H.R.S.....	5·06
,,	Swaffham	·99	XVII.	Keith H.R.S.....	1·59
V.	Salisbury, Alderbury ...	1·56	,,	Forres H.R.S.	1·00
,,	Bishop's Cannings	1·46	XVIII.	Fearn, Lower Pitkerrie..	1·73
,,	Blandford, Whatcombe .	1·44	,,	N. Uist, Loch Maddy ...	2·80
,,	Ashburton, Holne Vic...	2·33	,,	Invergarry.....	4·32
,,	Okehampton, Oaklands.	1·63	,,	Aviemore H.R.S.	1·50
,,	Hartland Abbey	1·39	,,	Loch Ness, Drumnadrochit	1·86
,,	Lynmouth, Glenthorne.	1·06	XIX.	Invershin	3·93
,,	Probus, Lamellyn	1·69	,,	Scourie	...
,,	Wellington, The Avenue	1·23	,,	Watten H.R.S.....	3·22
,,	Wincanton.....	1·53	XX.	Dunmanway, Coolkelure	7·91
VI.	Clifton, Pembroke Road	1·22	,,	Cork, Wellesley Terrace	4·84
,,	Ross, The Graig	1·84	,,	Killarney, Woodlawn ...	5·92
,,	Wem, Clive Vicarage ...	1·38	,,	Caher, Duneske	3·88
,,	Cheadle, The Heath Ho.	1·11	,,	Ballingarry, Hazelfort...	2·82
,,	Worcester, Diglis Lock	1·72	,,	Limerick, Kilcornan ...	2·04
,,	Coventry, Priory Row ..	1·81	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	·84	,,	Miltown Malbay	3·73
,,	Horncastle, Bucknall ...	·70	XXI.	Gorey, Courtown House	2·83
,,	Worksop, Hodsck Priory	·97	,,	Athlone, Twyford	2·76
VIII.	Neston, Hinderton	1·39	,,	Mullingar, Belvedere ...	2·87
,,	Southport, Hesketh Park	1·87	,,	Longford, Currygrane...	2·97
,,	Broughton-in-Furness ...	3·57	XXII.	Woodlawn	2·97
IX.	Ripon, Mickley.....	1·72	,,	Crossmolina, Enniscoe ..	3·67
,,	Melmerby, Baldersby ...	2·09	,,	Collooney, Markree Obs.	2·56
,,	Scarborough, Observat'y	1·64	,,	Ballinamore, Lawderdale	3·13
,,	Middleton, Mickleton ...	1·80	XXIII.	Warrenpoint.....	2·60
X.	Haltwhistle, Unthank...	1·72	,,	Seaforde.....	3·25
,,	Bamburgh	1·32	,,	Belfast, Springfield	2·18
,,	Keswick, The Bank.....	4·34	,,	Bushmills, Dundarave..	2·24
XI.	Llanfrechfa Grange	1·72	,,	Stewartstown	3·50
,,	Llandovery	2·18	,,	Killybegs	3·07
,,	Castle Malgwyn	3·06	,,	Lough Swilly, Carrablagh	2·68
,,	Builth, Abergwesyn Vic.	2·78			

OCTOBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·56	— 2·33	·14	18	9	67·2	17	31·9	7	1	7
II.		Tenterden	·24	— 3·79	·09	2,18	7	66·0	19	33·5	8	0	4
,,		Strathfieldsaye	·11	...	·04	25	5	...	...	...	...	...	...
III.		Hitchin	·62	— 2·45	·19	18	13	65·0	17	30·0	6	3	...
,,		Winslow (Addington)	1·24	— 1·85	·41	18	9	66·0	17*b*	28·0	6	3	6
IV.		Bury St. Edmunds (Westley)	·85	— 2·42	·39	2	8	63·0	17	37·0	...	0	...
,,		Norwich (Brundall)	·94	...	·29	19	15	66·6	17	32·4	7	0	6
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	·94	...	·50	15	8	62·9	2	40·3	7	0	0
,,		Polapit Tamar [Launceston]..	1·50	— 3·43	·56	14	14	66·2	19	30·3	7	2	3
VI.		Stroud (Upfield)	1·56	— 1·47	·55	15	11	64·0	1,17	37·0	6*f*	0	...
,,		ChurchStretton(Woolstaston)	1·10	— 2·67	·55	15	10	63·5	18	38·0	12*g*	0	0
,,		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	1·36	...	·53	15	21	72·0	30	25·0	6	5	23
,,		Boston	·91	— 2·20	·33	2	12	64·0	17	32·0	26	1	...
,,		Hesley Hall [Tickhill].....	·99	— 2·11	·28	2	12	67·0	17	32·0	6, 26	1	...
VIII.		Manchester(PlymouthGrove)	1·76	— 1·61	·55	14	7	66·0	29	34·0	11	0	1
IX.		Wetherby (Ribston Hall) ...	1·57	— 1·56	·62	14	6	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·97	— 3·06	·90	14	11	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·37	— 2·28	·43	2	7	65·0	17	30·0	13*h*	2	7
X.		Newcastle (Town Moor)	1·22	— 1·90	·53	14	5	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	8·72	— 1·87	1·64	16	15	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·91	— 2·63	·39	14	12	...	...	...	...	...	...
,,		Haverfordwest	1·96	— 3·19	·71	14	16	62·9	17	32·8	13	0	7
,,		Aberystwith (Gogerddan) ...	1·81	— 3·54	·60	2	10	68·0	28	26·0	23	8	...
,,		Llandudno.....	1·46	— 1·93	·54	2	15	66·0	17	42·0	13	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·88	— ·38	·76	14*a*	8	64·0	22	26·0	14	2	...
XIII.		Edinburgh (Blacket Place)...	1·27	...	·48	14	10	64·5	17	29·7	14	2	4
XIV.		Colmonell	2·60	...	·52	16	12	70·0	6	27·0	13	...	...
XV.		Lochgilphead (Kilmory).....	3·98	— ·81	·74	16	15	...	...	25·0	13	2	...
,,		Mull (Quinish).....	3·59	— 1·70	·58	17	15	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·70	— 1·26	·70	16	7	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·20	— ·04	1·05	15	14	61·0	3	29·7	14	2	...
XVII.		Braemar	2·74	— ·87	·90	17	15	64·2	22	24·0	26	8	20
,,		Aberdeen (Cranford)	2·58	...	1·44	16	17	64·0	21*c*	29·0	13	2	...
,,		Cawdor (Budgate)	1·13	— 1·60	·28	15	11	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·23	— ·42	·96	15	8	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·11	...	·91	10	18	65·0	27	29·6	14	1	...
XIX.		Dunrobin	3·14	— ·17	1·20	15	14	62·0	20	31·0	14	3	...
,,		S. Ronaldsay (Roeberry).....	3·03	— ·70	·48	15	17	57·0	21*d*	36·0	14	0	...
XX.		Darrynane Abbey.....	4·34	...	·93	13	20	...	...	...	...	...	...
,,	IRELAND.	Waterford (Brook Lodge) ...	3·52	— ·30	·90	16	14	64·0	1	33·0	12	0	...
,,		O'Briensbridge (Ross)	3·70	...	·49	17	15	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·01	— ·28	·79	14	13	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·11	— 1·27	·64	14	14	62·9	17	36·1	12	0	0
XXII.		Ballinasloe	3·07	+ ·08	·74	16	19	59·0	17*e*	37·0	12	0	...
,,		Clifden (Kylemore)	4·95	...	1·44	16	13	...	...	...	...	...	...
XXIII		Waringstown	2·63	— ·08	·86	14	14	65·0	21	29·0	12	1	7
,,		Londonderry (Creggan Res.).	3·30	— ·37	1·03	15	16	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·43	+ ·33	1·05	14	15	61·0	20	32·0	12	1	5

+ Shows that the fall was above the average ; — that it was below it.

a—and 16. *b*—and 18, 30. *c*—and 22. *d*—and 28. *e*—and 20. *f*—and 7, 12. *g*—and 13. *h*—and 14.

METEOROLOGICAL NOTES ON OCTOBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—By far the driest October recorded; 1879, with ·87 in., being the only other year out of 35 without an inch of R; 1890, with 1·21 in., was the last dry October. Ground remarkably dry, and ponds and wells very low. Mean temp. 5° higher than in 1896. Dews heavy, especially at the end of the month, but weather beautiful and like spring. Total sunshine 157 hours.

HITCHIN.—The driest October since 1878, and the second driest October in our record, which extends to 1849.

ADDINGTON.—A fine October; some days very fine, particularly the 30th, which was quite summer-like, bright and warm, while the 31st was foggy and cold, with a max. temp. 18° lower. Small rainfall, and little frost after that of the 6th, which cut off tender plants. Grand weather for the land; seed-corn got in in fine condition, and root crops well secured. Foggy on six days.

BURY ST. EDMUNDS, WESTLEY.—A very beautiful autumnal month, and the driest October since 1876. From the 14th very mild and summer-like, with foggy mornings and sunny days. Dense fog on 31st.

NORWICH, BRUNDALL.—The finest October for many years, and the driest since 1879. Rainfall 2·11 in. below the average. Mean bar. pressure 30·187 in. Mean temp. 50°·6. Dense fog on 19th. Wet fogs from 26th to 31st.

TORQUAY, CARY GREEN.—Rainfall 3·41 in. below the average. Total R of the ten months ·89 in. above the average. Mean temp. 54°·2, or 3°·1 above average. Duration of sunshine 97 hours 45 minutes, being 18 hours 35 minutes below the average. Ten sunless days.

POLAPIT TAMAR.—Uncommonly dry; the smallest rainfall for October during the past 17 years. Very calm generally throughout the month, and warm for the time of year. Prevalent winds easterly. Gale on 17th. Thick fog at night on 19th.

WOOLSTASTON.—A beautiful, bright, sunny, autumn month, with no frost and but little rain, except on the 15th, when it fell heavily. Mean temp. 50°·3.

ROTHERBY HALL.—The driest October since 1888, when only ·51 in. fell, the R being 1·70 in. below, or considerably less than half, the average of ten years. Although R fell in small quantities on 21 days, there were mild, bright intervals, and the autumnal tints have been more beautiful than usual. The ground was so hard that the customary first meet of the Quorn hunt (Nov. 1st) had to be postponed. Mean temp. 49°·0.

MANCHESTER, PLYMOUTH GROVE.—The rainfall of the month is the smallest in October for 31 years, with the one exception of October, 1888, when the rainfall was the same. Dense fog on 1st. T and L on the 10th. Fine autumn weather from the 16th to the end of the month, and very mild for the season.

ARNCLIFFE.—A very dry month, with little frost.

HULL, PEARSON PARK.—Fogs on 7 days, and all day on 30th.

WALES.

HAVERFORDWEST.—Since October, 1850 and 1879, there have been no very dry Octobers; in the first-mentioned year the fall was 2·09 in., and in the second 2·27 in.; thus it will be seen that October, 1897, had the least R of the series commencing 1849. Although the rainfall was small, there was a great deal of broken weather, and it was very wet from the 13th to 19th, with moderate gales from 15th to 17th. The last week was fine, with bright days and hoar frost on some nights. The month generally was mild, and the shade temp. did not fall below 32°. Fog on 7th, 19th, 20th and 28th.

ABERYSTWITH, GOGERDDAN.—Beautiful weather throughout the month, bright, and some days very hot. The finest October remembered.

SCOTLAND.

CARGEN [DUMFRIES].—The month was characterised by very marked deviations from the means of 38 years; the bar. pressure being greater by ·269 in., the temp. higher by 1°·6, than the averages; while there was 1·61 in. less R and 44 hours more sunshine. The mean reading of the bar. for the month has only once been exceeded, in October 1879. Temp. has been higher and R less in 6 years since 1860, while only in 1870 and 1872 has more sunshine been recorded. The 14th was remarkably cold, the temp. not rising above 42°, and falling as low as 26°; on the 15th the mean temp. was 47°·5, and continued to rise until it reached 57°·6, on the 17th; for the seven days 16th to 22nd inclusive, the mean was 53°·1. 2·42 in. of R fell in the four days 14th to 17th, but no R fell after the 17th. Light easterly winds were prevalent. L on 23rd, and T on 29th.

EDINBURGH, BLACKET PLACE.—Mean pressure 30·106 in., the highest in October since 1866. Mean temp. 2°·0 above the average. Fog on 6 days, the greatest number in October since 1827, with six fogs, but in 1786 seven fogs were recorded. S.W. gale on 16th and 17th.

COLMONELL.—Rain 2·33 in. below, and mean temp. 4°·6 above, the average of 21 years.

MULL, QUINISH.—Wet and stormy till the 18th, then high temp. and constant sunshine. Laburnums in flower on 23rd, and ripe raspberries picked on 28th.

BRAEMAR.—Changeable and disagreeable to the 18th, but from thence finer weather could not be desired.

ABERDEEN, CRANFORD.—Warm for October, the min. temp. being above 50° on several nights.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet, the second half very fine. Mean temp. 48°·5, or 2·5 above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—A fairly dry month, except from 11th to 18th inclusive, when 3·03 in. of R fell, 2·70 in. of which was on 13th, 14th, 15th and 16th. Nearly all the fall of ·83 in. on the 16th was after 6.30 p.m. L and a heavy peal of T on 15th.

WATERFORD, BROOK LODGE.—A very mild month, although there was a good deal of easterly wind. T and L between 10 and 11 p.m. on 15th.

O'BRIENSBRIDGE, ROSS.—Perfect weather from 17th to 28th; the days bright, warm and calm, and the nights fine, but chilly.

DUBLIN, FITZWILLIAM SQUARE.—Quite unlike the cold Octobers of 1894, 1895 and 1896, this month was strangely genial and fine; the temp. of the air actually rose towards the close, thus reversing the seasonal change for the time of year. The weather of the second week was, indeed, rough and wet; but this only accentuated the quietness and mildness of the beginning and end of the month. The mean temp., 52°·3, is 2°·6 above the average. The temp. in screen did not fall to 36°, or on the grass to 32°. L was seen on the 15th. High winds occurred on 9 days, attaining the force of a gale on 10th, 16th and 17th. Fog on 9 days; H on 10th; lunar halo on 7th; solar halo on 28th.

WARINGSTOWN.—A very fine month, with only a week's rain in the middle. Unusually warm; sub-tropical plants in sheltered situations being still uninjured at the end.

EDENFEL.—With the exception of the second week, when rains of a torrential character fell on three days, the month was one of the most remarkable Octobers on record, not only from the absence of R at other times, but from the frequently clear, and always calm and mild, atmosphere prevailing throughout.

BRITISH RAINFALL.

Subscriptions of £1 and upwards, or payments for publications to that amount, received from November 13th to December 10th :—

	£	s.	d.
Browne, Major	1	0	0
Hales, General	1	0	0
Henshall, E., Esq., C.E.	1	1	0
Ramsden, Miss	1	0	0

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIII.] DECEMBER, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

A WET DAY IN A WET DISTRICT.

To the Editor of the Meteorological Magazine.

SIR,—When a man in any part of Britain finds over six inches of rain collected in his gauge in a day, it shows no unreasonable inquisitiveness if he asks his neighbours how they fared. Such was my position on the morning of 13th November, 1897, and I think your readers will care to see the result of my enquiry. There was nothing to call a storm—certainly no thunder storm—anywhere, only the rain kept pegging away (in my case for 23 hours out of the 24), as if it meant business, and indeed it was not idle the next day, for I measured 1·00 in. for 13th November.

I give, in the subjoined table, the record for 12th November: at 14 stations in "the Lake District," and add the number of days on which the same gauges have registered 3·00 in., or more, in a day, during the 7 years 1890–96, and the highest day's record in the same period. But, as these stations are in a wet district, I add also the average yearly rainfall at each for the same period. Seven years is, of course, an utterly inadequate period to give an average rainfall, but it serves to show the relative wetness of these stations, and for several of them no longer average is available. The figures for 12th November are very high, and I believe in most cases are the highest recorded since observations began, but to show how far the rainfall was excessive *for the locality* I have cast out how many average days rainfall that of 12th November amounted to, at each place. The highest equivalent in days is 28, or in other words, less than 8 per cent. of a year's rainfall fell on 12th. I think you have stated that 20 per cent., or in dry places 25 per cent., of a year's record may fall in a day, but those figures, fortunately, do not apply to this district,—if they did we should have no roads left.

Yours, &c.,

STEPHEN A. MARSHALL.

Skelwith Fold, near Ambleside.

Rainfall in the Lake District, November 12th, 1897.

Stations.	Rainfall 12th November, 1897.	Average yearly rainfall, 1890-96.	No. of average days rainfall to equal that of 12th Nov., 1897.	No. of days in 7 years, 1890-96, giving 3·00 in., or more.	Highest day's record in those 7 years.	Fall on Nov. 12th, per cent. of yearly mean.
Lancashire—	in.	in.			in.	
Hawkshead (Esthwaite Lodge).....	4·22	68·67	22	2	3·70	6·2
Duddondale (Seathwaite Vicarage).	4·07	80·25	19	2	3·80	5·1
Skelwith Fold.....	6·03	80·53	27	3	3·18	7·5
Westmoreland—						
Skelwith Bridge.....	6·35	81·92	28	2	3·56	7·8
Ambleside (Lesketh How).....	4·45	78·03	21	0	2·97	5·7
Elterwater (Birch Hill)	4·57	90·75	18	8	4·24	5·0
Dungeon Ghyll.....	5·90	112·27	19	18	4·90	5·3
Loughrigg (High Close)	4·33	83·37	19	6	3·60	5·2
Grasmere (Pavement End).....	4·38	89·00	18	9	4·15	4·9
Patterdale.....	4·55	82·15	20	3	4·15	5·5
Cumberland—						
Borrowdale (Seathwaite)	8·03	131·39	22	27	6·79	6·1
,, (Rosthwaite)	6·94	101·43	25	10	5·33	6·8
,, (Grange).....	5·93	88·84	24	—	4·45	6·7
Derwentwater (Barrow House).....	3·98	72·19	20	1	3·01	5·5

[In the above letter Mr. Marshall has given the essential features of this remarkable rain, and the only addition which we can at present make to it, is to mention that in the much drier district round Cockermouth, the fall was between 4 and 4½ in., which of course was, relatively, even more remarkable. We are sorry to hear of one gauge having been washed away by a flood, and still more sorry (because it could have been prevented) to hear of two others having been allowed to run over. The following cutting gives a popular account of the rain. A few days later there were falls in North Wales (on 14th and on 18th) exceeding 4 in., but these must stand over for *Brit. Rain.*, 1897.—Ed.]

Heavy Storm in Kendal.—Until last week, for almost a whole month, there was no rain in the neighbourhood of Kendal, the fading autumn being remarkable in its mildness. In fact not since 1872 has there been such an autumn. As if to make amends for this long inaction a severe storm overwhelmed the district on Friday. Throughout the day the rain came down pitilessly—not in the half-hearted manner of the earlier showers which indicated the change, and between eight o'clock on Friday morning and eight o'clock the following morning no less than 2·73 in. of rain was registered by Messrs. Rhodes' rain gauge, only a third of an inch less than the whole quantity which fell in October. Naturally the Kent rose rapidly, and on Saturday morning had overflowed its banks, the footpath on Waterside being covered with water. On the shingle on New Road a number of swingboats had been erected for the Martinmas fair, but not a vestige of them remained this morning, the whole body being washed towards the estuary of the river. Other damage was done of a minor nature, and during the morning it was evident that the country above had not altogether escaped, hugh limbs of trees, &c., rolling along with the surging water. Between Kendal and Burneside *many* fields were flooded.—*Westmoreland Gazette.*

THE GREAT METEORIC SHOWER OF NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—When a man writes upon a scientific subject he at once assumes a serious responsibility, and it behoves him to be careful in presenting the truth in all the statements he makes and the figures he quotes. Now, when I said in my pamphlet on "The Great Meteoric Shower of November" that one of the observers of the shower in 1866 must have made a mistake when he said "the largest of the meteors was not twice the apparent brilliancy of Sirius," I did so on the best of evidence, and the statement can easily be substantiated. You take serious exception to it. Very well. There is a mass of observations in the *Monthly Notices Roy. Ast. Soc.*, Vol. 27; *British Association Report*, 1867; *Proceedings of the Meteorological Society* for November 21st, 1866; *Astronomical Register*, December, 1866, &c., &c., which distinctly proves one thing, and that is that some of the meteors were considerably brighter than Venus ever is, and far and away superior in lustre to twice that of Sirius. My pamphlet furnishes ample evidence on the point from the descriptions published at the time. I have not mentioned my own observations, but I may say that during the night I saw several meteors which momentarily lit up the sky and landscape with flashes more intense than the light of any planet. Taken as a whole, the meteors of November, 1866, were considerably brighter than the August Perseids; they were also brighter than the Andromedes of Biela's comet in 1872 and 1885, and brighter also than the average of members of ordinary meteoric streams.

You suggest that an index would have improved the pamphlet. So it would; but it was only a reprint, and extras were avoided to save expense. As to the stationary meteors, I have devoted a long paragraph to them on p. 27, and it is quite sufficient for the purpose, for the Leonid shower presents a hundred points besides end-on meteors. You say there is no reference to efforts to photograph the area surrounding the radiant. There is such a reference on p. 46, brief though it is, but I refrained from enlarging on the subject of meteoric photography, as it is a department in which I can boast of no experience whatever, and it is sometimes just as well not to assume to teach before one has played the part of pupil.—Yours faithfully,

W. F. DENNING.

Bristol, Dec. 7th, 1897.

[It is strange that Mr. Denning does not see that this letter does not carry matters farther than his pamphlet, for he has not disposed of either of the authorities we quoted—viz., Backhouse, Baxendell, and Hind—but he will probably be gratified by our printing the letter, and we have no objection to so doing. The concluding statements are excellent illustrations of the difficulty of finding what there is in a book without an index. We cannot devote any more space to the subject.—ED.]

TEMPERATURE VARIATIONS IN NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—The variations in the temperature at 9 a.m. during the past week have been so extraordinary that I think they are worthy of record:—

November 14th	....	55·1°	a fall of 17·0°
,, 15th	.....	38·1°	
,, 16th	.....	39·5°	a rise of 14·8°
,, 17th	.....	54·3°	
,, 18th	.....	52·9°	a fall of 21·4°
,, 19th	.....	31·5°	
,, 20th	.....	46·3°	a rise of 14·8°

This changeable weather has been very trying to the delicate and to old people, accompanied, as it has been, by considerable fog.

Yours very truly,

RICHARD TYRER.

Cheltenham, November 23rd, 1897.

Although at Camden Square the fluctuations of temperature in November, 1897, were not quite so great as at Cheltenham, they appeared to be sufficiently so to call for a study of back years to see how far they were exceptional, and the following table is believed to contain all cases in the 39 years, 1858–96, which approximate to the 1897 values. It will be seen that in five out of these eight November weeks the total range was greater than in 1897.

TABLE I.—*Weeks in November with great Variation of 9 a.m. Temperature at Camden Square.*

1897		1895		1893		1883		1867		1866		1865		1861	
Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date	Reading.	Date.	Reading.
14	54·8°	14	48·2°	22	39·1°	4	45·2°	1	61·2°	8	55·0°	14	38·2°	23	38·5°
15	42·8	15	45·3	23	30·4	5	42·5	2	45·8	9	45·0	15	51·8	24	30·4
16	42·2	16	60·9	24	35·0	6	55·0	3	35·0	10	35·0	16	36·0	25	42·4
17	54·1	17	49·2	25	45·2	7	36·9	4	49·5	11	54·6	17	54·3	26	54·7
18	55·0	18	34·0	26	46·3	8	40·4	5	43·0	12	47·0	18	42·6	27	43·6
19	35·4	19	38·8	27	30·3	9	49·6	6	38·8	13	52·9	19	50·0	28	36·5
20	44·3	20	47·0	28	50·0	10	38·4	7	41·2	14	43·8	20	54·0	29	52·7
Total Range	19·6	...	26·9	...	19·7	...	18·1	...	26·2	...	20·0	...	18·3	...	24·3

It is not easy to adopt any rigid system of comparison between such variable data, but the seven calculations set out in the columns of the second table were assumed to give a fair indication of the variableness of each period, and every instance in which any four of the columns equalled or exceeded 1897 is set out in the table.

TABLE II.—*Sum of the Variations of 9 a.m. Shade Temperature at Camden Square in November weeks showing excessive range.*

YEAR.	Greatest Variation in one direction.		Cumulative Variations in both directions.				
	Between 2 days.	Between 3 days.	3 days.	4 days.	5 days.	6 days.	7 days.
	°	°	°	°	°	°	°
1897	19·6	19·6	28·5	32·4	41·3	45·0	53·9
1895	15·6	26·9	27·3	42·5	47·3	55·5	58·4
1893	19·7	19·7	35·7	36·8	47·0	51·6	60·3
1883	18·1	18·1	30·6	34·1	43·3	54·5	57·2
1867	15·4	26·2	26·2	40·7	47·2	51·4	53·8
1866	19·6	20·0	29·6	39·6	47·2	53·1	62·2
1865	18·3	18·3	34·1	47·7	59·4	66·8	70·8
1861	16·2	24·3	24·3	35·4	46·7	58·7	66·8

In 1897 the greatest difference between any two consecutive 9 a.m. readings is 19°·6, while in 1866 it is the same (19°·6), and in 1893 slightly greater (19°·7); but taking periods of several days, 1866, 1865 and 1861 far exceed 1897 for variability of 9 a.m. temperature. Thus in one week in 1865 the 9 a.m. temperatures show a total zigzaging of 70°·8, while the 1897 fluctuations add to only 53°·9, which is with one exception the smallest value for a whole week in the table.

THE DROUGHT OF OCTOBER AND NOVEMBER, 1897.

To the Editor of the Meteorological Magazine.

SIR,—In your interesting paper on the dryness of October, 1897, I see no mention of Somersetshire; but the deficiency of rain here, at a point 8 miles W. from the Wiltshire boundary, and 5 miles N. from that of Dorset, though we did just pass the one inch, was, for a western county, more remarkable than that in many of the places which you did name; and now that an even drier November has followed it, the result seems worthy of record.

October yielded here 1·04 in. in 10 days, of which ·80 in. fell in four days (15th to 18th). November yielded ·96 in. in ten days, of which ·66 in. fell in the last four days, and a third part of that really in December. There was absolute drought from early morning of October 19th to late evening of November 7th, *i.e.*, more than 19 days. N.B.—A few heavy drops, not enough to measure, fell in the evening of October 29th. Partial drought could be reckoned till evening of November 27th, *i.e.*, more than 39 days with ·30 in. of rain. The total for the two months thus goes down as exactly two inches!

H. A. BOYS, M.A.

North Cadbury Rectory (250 ft. above sea), Dec. 1st, 1897.

P.S.—The first frost *at all* felt in my garden this autumn was on November 26th.

To the Editor of the Meteorological Magazine.

SIR,—A dry November has followed a still drier October, 0·86 in. of rain having fallen here in October, and 0·95 in. in November. The average for the 10 years, 1887-96, is, for October, 3·31 in., and for November, 2·97 in., together 6·28 in., so that this year the fall in the two months was under 29 per cent. of the average for the last 10 years. Previously the least fall in October was 1·01 in. in 1888, in November, 1·14 in. in 1889, and for the two months together 4·03 in., in 1890. The remarkable circumstance is not, therefore, the small rainfall in *either* of these months, but that *both* the consecutive months which are usually about the wettest in the year should have been so dry.

Yours faithfully,
JOHN HOPKINSON.

The Grange, St. Albans, 6th December, 1897.

GALE ON NOVEMBER 28TH, 1897.

THE above ought not to pass without record in these pages. Although with many statements as to its severity we cannot agree, there is no doubt that very many lives were lost, and hundreds of thousands of pounds worth of property destroyed. The mischief, however, was due to tidal action rather than to that of wind. In London the barometric pressure fell fast (0·30 in. in 4 hours, noon to 4 p.m. on Sunday 28th), but this rate is by no means unprecedented, and we have known the wind much stronger. Confirmation thereof is afforded by the very trifling structural damage in the metropolis; one hoarding blown down, and a few slates and chimney pots carried away.

In the centre, E. and N. of England the gale was heavier, many chimneys and a few partly built premises, trees, and telegraph posts were blown down; but the damage was not comparable with that of the storms of March 24th, 1895, and of March 3rd, 1897.

Over the North Sea, and Southwestward, as far as Boulogne, the wind force was no doubt great, but the chief source of mischief was due to the intensity of the storm occurring at nearly the time of high water spring tide. Hence the Eastern coasts and both sides of the mouth of the Thames suffered severely, buildings being wrecked or flooded at Southwold, Ipswich, Harwich, Ramsgate, Margate, Herne Bay, Whitstable, Sheerness, Southend, Purfleet, Woolwich, and other places.

As is usual with such storms, there was some electrical disturbance. The first was at 8 p.m. on 27th, a single brilliant flash and very loud T at Durness, Sutherland. There was a TS in South Lincoln in the afternoon of 28th, and L was seen at various points along the coast from Suffolk to Yorkshire; later in the evening the TS became severe in South Nottinghamshire (the church of All Saints', Nottingham, was struck) and in the East Riding of Yorkshire. The L and T did not entirely cease until the early hours of the 29th.

REMARKABLE HAILSTONES.

ABOUT 5 o'clock in the afternoon of August 10th I was at Manassas depôt, in Prince William County, Va., near the famous battlefield, waiting for a train. There was some pretty severe thunder and lightning for a half-hour or so, and then came a heavy shower of rain, during which there was the most remarkable fall of hail I have ever witnessed. I hurried out in the rain to examine the stones and picked up several. These were nearly square flattish blocks, say from $\frac{3}{4}$ to 1 inch in length and breadth, and from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in thickness. They suggested, by both shape and size, the ordinary "chocolate caramels" of the confectioner. There were some 8 or 10 persons, I think, in the station house with me, and several of these, observing my interest and enthusiasm, began to pick up the larger stones and bring them in to me and to my friend, Professor Hargrove, of Luray, Va. Soon larger and larger ones were thus collected, and I sought for means of measuring or weighing them. No rule or scales could be found, and so we set ourselves, several of us, conjointly and carefully to estimate the dimensions. I recorded at the time one as being, honestly estimated, "2 inches long, $1\frac{1}{2}$ inches wide and $\frac{3}{4}$ of an inch thick," these being rather the average than the extreme dimensions.

It then occurred to me to make an outline drawing of the largest by laying it flat upon a page of my pocket memorandum and carefully running a pencil around it. I secured in this way, a rather rough but fairly accurate outline of two. These outlines have been exactly copied (including some lines due to a slipping of the block or to a different inclination of the pencil) and are given in the accompanying cuts. The extreme lengths of these will be found to be, respectively, about $2\frac{1}{2}$ and 3 inches; their extreme breadths about $1\frac{1}{2}$ and 2 inches. The thickness of No. 1 was recorded at the time as being by estimate $\frac{3}{4}$ inch; that of No. 2 as being 1 inch. I estimate their volumes as about $1\frac{3}{4}$ cubic inches for No. 1, and nearly 3 cubic inches for No. 2. The drawing of No. 2 was done more hastily, as just in the midst of it my train rushed in and I had to leave. But I took my trophy with me, and, with perhaps pardonable enthusiasm, paraded it through the cars, and, exhibiting it to the passengers, asked expressions of opinion from them as to its size relatively to that of a popular object of comparison, a guinea egg. Perhaps 20 or 30 passengers agreed, without dissent, that it was as large or larger. Some said, "It is as large as a hen's egg;" all agreed, also, that they had never seen so large a hailstone before. Upon breaking it to pieces, I found a sort of nucleus of somewhat less transparent ice at the centre, but observed no concentric layers or other marked structure of any kind; it was quite solid and tolerably transparent throughout. Both of these stones were characterized by blunt points or projections, as shown in the figures; and the sides also, while flat in the main, were uneven, with low, rounded elevations and depressions of the same sort, the general thickness being fairly uniform.

I think that very few of these stones or blocks fell. Perhaps they would have been a yard or two apart as they lay on the ground. I think it likely also that the storm of hail was of brief duration, say 10 or 15 minutes, and that it embraced a very limited area.

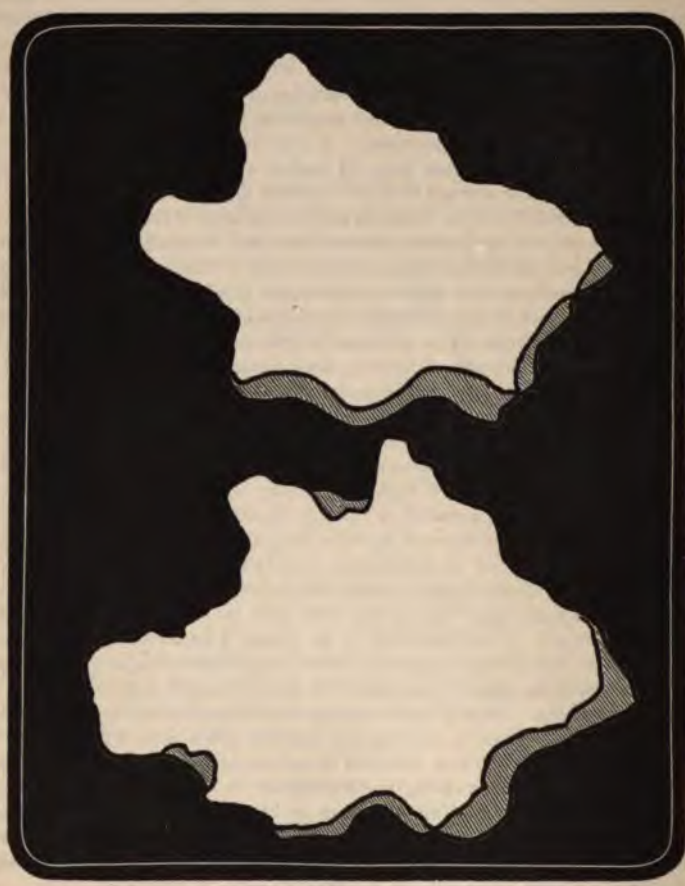
It was, perhaps, about over when I took the train, as I infer from the fact that I have seen no account of it in the papers; and I found at the next station, only 5 miles off, that the road was dry and dusty.

I regret exceedingly that no more accurate observations seem to have been made of what must have been a most notable hailstorm, and I diffidently submit my own crude and imperfect account in the hope that thereby something further may be elicited in regard to it.

CHARLES H. WINSTON.

Richmond College, Va., August 25th, 1897.

[*Science, September 17th, 1897.*]



Natural size of Hailstones which fell at Manassas, Virginia, U.S.A. (Lat. 38° 41′ N., Lon. 77° 33′ W.), August 10th, 1897.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of the session was held on Wednesday evening, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

The following candidates were elected Fellows of the Society—Charles Aburrow, A.M.I.C.E., William Berridge, Ronald Stanley Clarke, Lawrence Gibbs, A.M.I.C.E., Sholto Henry Hare, F.R.H.S., Henry George Hollingworth, F.R.G.S., F.R.A.S., Major Henry King, Arthur Newsholme, M.D.

Mr. R. H. Curtis reported the Results of a Comparison between the Sunshine Records of a Campbell-Stokes Burning Recorder and a Jordan Photographic Recorder.

The paper opens with a history and description of the two forms of recorder, and sets out the following conditions as requisite for a satisfactory comparison :—

(1)—Care must be taken that the instruments are in proper adjustment, and are fair examples of the types.

(2)—They should occupy positions similar in every respect, and such as to give an absolutely clear horizon.

(3)—The comparison should extend over a period sufficiently long to test them under varying seasons; and to detect any circumstance which might unfairly prejudice either instrument.

The observations were all made by Mr. E. T. Dowson, at Geldeston, Norfolk, in a position fulfilling the above requirements.

The curves from both instruments were measured independently by the author, and by three gentlemen, all experienced in dealing with sunshine traces, but neither tabulator saw the measurements of the others, nor did he know when tabulating the cards of one instrument what had been recorded for the same days by the other instrument.

The final values adopted for the twelve months, June, 1896,—May, 1897, are—

Tabulators.	A. Hours.	B. Hours.	C. Hours.	D. Hours.
Campbell-Stokes recorder...	1,500	1,500	1,522	...
Jordan recorder.....	1,363	1,412	1,416	1,454

The conclusions drawn from the figures are :—

The Campbell-Stokes records are capable of being measured with a very fair degree of accuracy.

The records of the Jordan instrument afford room for greater difference of opinion as to what ought to be tabulated, but when the whole of the photographic trace which can be distinctly seen, is carefully measured, the amount will approximate sufficiently to that of the Campbell-Stokes instrument to allow of records obtained from both forms of instrument being compared *inter se*.

A section on the capabilities of the Campbell-Stokes recorder shows that it will register up to 15 minutes of the time of sunrise and sunset, while at Geldeston 94·5 per cent. of the possible duration was recorded on May 30th, 1881, and the same percentage at Jersey, on June 23rd, 1896.

The paper also discusses at some length the question how much of the trace of each instrument should be measured, photographic chemicals, effect of age on plates, and effect of washing to fix the trace. It gives for 12 years records for May at 7 Observatories, the results of tabulation at the Observatories and at the Meteorological Office, to show the effect of personal equation. It gives also a suggested specification for the Stokes recorder fixing density and size of sphere, and concludes with an appendix on the faulty instrument at Greenwich.

The President (Mr. Mawley) proposed a vote of thanks to Messrs. Dowson and Curtis. He was surprised to hear that the Jordan recorder gave a smaller value than the Stokes. He did not think that the Greenwich ball, which had a milk and water like appearance, could have been put up in that condition, but his own, which had been in use for 17 years, shows no sign of deterioration.

Mr. Ellis described the various instruments which had been used at various times at Greenwich, and gave a critical examination of the records to show the falling off in recent years.

Mr. Marriott spoke of the defects which he most frequently found in sunshine recorders when inspecting stations, and described his methods of testing their adjustment and exposure.

Mr. Kendrick spoke, as a scientific expert on glass, describing the composition of a ball supplied to Greenwich Observatory, the most suitable glass for the spheres, and the chemical action which is likely to take place and cause deterioration in some qualities of glass.

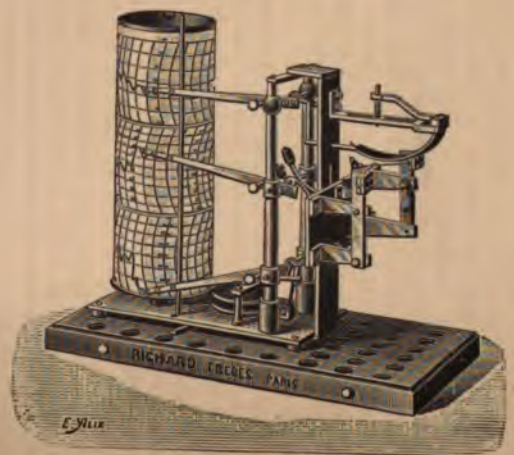
Mr. Davis said, that in the Argentine, glass spheres had remained perfect for 10 years. Stations at the foot of the Cordilleras recorded from 70 to 75 per cent. of the possible duration of sunshine, while those in the region of the great rivers recorded from 56 to 58 per cent.

Mr. Jordan, speaking of the photographic recorder, said that it was wrong to ignore any trace, no matter how faint. It cannot record too much, the faintest trace being necessarily due to the sun's rays, and as washing reduces faint traces it is all the more necessary to record everything. Experiments at Kew, and elsewhere, gave identical results for the two instruments, and he was, therefore, surprised at the results in the paper.

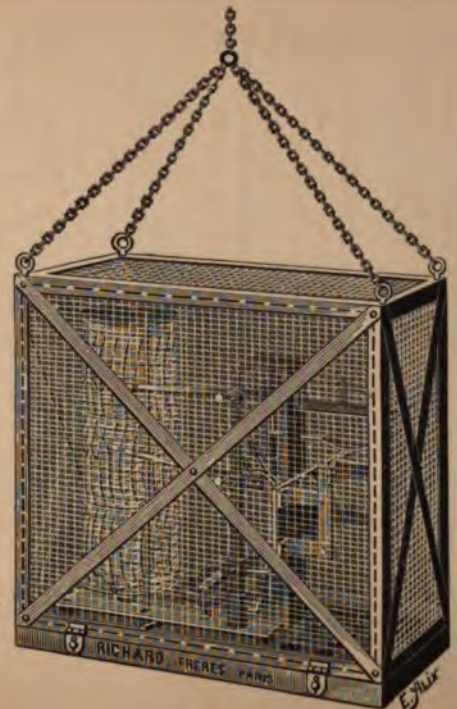
Mr. Gaster considered both the burning and photographic recorders excellent, and vastly superior to the estimates before they came into use. In the paper the measurements of the Jordan traces had been unduly restricted. The Jordan was introduced because the Campbell did not record the faintest sunshine, and originally the traces of the Jordan instrument were measured before washing, but the result was

RICHARD'S BAROGRAPH, HYGROGRAPH, AND THERMOGRAPH.

(For use with Kites or a Balloon.)



THE INSTRUMENT.



In its Cage.

[*See page 175.*]

so large that comparison was impossible, and, therefore, washing was introduced to make the records of the two instruments fit.

Mr. Brodie thought that the apparent agreement of the two instruments disappeared if the monthly values were examined, instead of the totals for the year; for in one winter month the Jordan gives 30 per cent. less, though on a fine winter day even the Stokes does not record enough.

Mr. Dixon hoped this excellent work would be continued, but it was impossible that the results of the two should agree, owing to the different absorption by the atmosphere, of the heat and of the actinic rays.

Mr. Symons read some remarks by Mr. Dowson on the different effect of an equal amount of washing, on the morning and afternoon traces of the Jordan record.

REVIEW.

Instruments de Précision. Ancienne Maison RICHARD FRÈRES, JULES RICHARD, *Fondateur et successeur. Catalogue No.* 1 *Météorologie.* 4to, Paris, 1897. 40 pp. and numerous engravings.

(*See Frontispiece.*)

THE catalogues of this firm are always interesting, for, the ingenuity of their instruments is remarkable, and the engravings are usually excellent; we mention this because the two which we have asked M. Richard to lend us are the weakest in the whole book.

We asked for these two because England is being left hopelessly in the rear in the exploration of the upper strata of the air—England, which, through Mr. Welsh, was the first to organise elaborate scientific work in balloons; which, through Mr. Glaisher, carried the same work to a point never before reached; England, which (through a Scotchman, Dr. Wilson) began the use of kites for scientific purposes in 1749; which, through the Rev. George Fisher and Admiral Back, used them in the Arctic regions in 1822–23 and 1836–37; which, through Mr. Douglas Archibald, was the first to send anemometers to great altitudes by means of kites—England and all the English colonies are doing absolutely nothing, and letting the Americans carry off all the honours for kite work, and our Continental neighbours all those relating to balloons.

We thought that an engraving of the compact little apparatus might tempt some Englishman to take up the subject of continuous records at high altitudes. Of course we cannot here go into full details, they are given in the work we are noticing; but it will be seen that pressure, humidity and temperature are simultaneously recorded on a single sheet of paper; and when we add that the total weight (the instrument being made of aluminium) is only *36 ounces*, it will be seen that the lifting of the apparatus is no difficulty.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	87·8	24	43·3	10	71·7	53·0	52·7	74	132·6	37·2	1·87	11	6·9
Malta	92·8	28	57·7	2	80·5	63·8	60·5	70	155·5	52·3	·00	0	2·4
Mauritius	80·9	1	59·8	25	76·7	66·7	61·6	73	126·2	50·4	2·51	13	5·8
Calcutta	97·1	10	73·5	2	90·5	79·0	77·6	81	161·0	72·7	10·98	12	7·0
Bombay	93·7	5	74·8	11	89·5	80·1	78·2	79	147·3	72·6	14·40	21	7·4
Ceylon, Colombo	91·2	9	73·8	20	86·4	77·7	76·1	87	142·5	72·0	10·14	25	7·8
Melbourne	67·7	18	31·5	13	59·2	43·4	43·9	76	117·1	20·9	1·64	7	3·2
Adelaide	69·0	8	39·1	12	60·2	47·8	44·9	72	124·0	28·1	1·59	11	6·5
Sydney	68·0	10	44·8	30	61·3	50·3	50·8	87	108·8	34·8	8·06	16	5·4
Wellington	60·0	8, 25	36·0	19	55·7	43·9	41·3	73	101·0	28·0	2·43	14	4·3
Auckland	64·0	13	40·0	21	58·7	47·3	44·0	72	120·0	34·0	3·70	17	6·1
Jamaica, Kingston	92·2	24	71·8	25	89·1	74·5	70·7	67	...	...	·58	5	5·3
Trinidad	90·0	*a*	69·0	6, 9	87·7	71·5	73·6	83	165·0	68·0	11·19	19	...
Grenada	85·8	1	71·0	4, 5	82·7	74·6	71·4	81	148·2	...	8·15	23	3·3
Toronto	84·0	24	38·8	2	71·2	51·0	51·2	68	100·0	32·2	2·92	10	5·7
New Brunswick, Fredericton	83·7	24	36·5	3, 8	67·1	45·6	47·4	60	...	...	3·18	14	5·9
Manitoba, Winnipeg	90·8	14	28·0	5	72·1	46·4	...	...	...	...	2·31	13	6·0
British Columbia, Esquimalt	72·2	21	41·2	10	65·2	50·5	48·2	72	...	...	·86	9	7·4

a—Several.

REMARKS.

MALTA.—Adopted mean temp. 71°·0, or 0°·6 below the average. Mean hourly velocity of wind 8·3 miles. Average sea temp. 71°·0. L on 6th, 7th and 8th.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 1°·0, and rainfall ·49 in., above their respective averages. Mean hourly velocity of wind 12·0 miles, or 0·6 above average; extremes, 26·1 on 6th, and 2·0 on 28th; prevailing direction E.S.E.
T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 8 days. Lightning was seen on the 22nd, 23rd and 27th.
H. O. BARNARD.

Adelaide.—Mean temp. 0°·5 above the average of 40 years. Rainfall 1·22 in. below the average.
C. TODD, F.R.S.

Sydney.—Rainfall 2·36 in. above, temperature 1°·4 above, and humidity 9 above, their respective averages. Soft, warm rains fell all over the Colony so abundantly that the drought conditions were completely broken up, and the weather was very mild.
H. C. RUSSELL, F.R.S.

Wellington.—Generally a showery month, but no heavy falls except 1·21 in. on 5th; some pleasant days at the beginning and end of the month. Prevailing wind from N.W., strong on 6 days; frequent fogs. Temperature 0°·8 above, and rainfall 2·67 in. below, their respective averages. Slight earthquake on 9th. R. B. GORE.

Auckland.—An unusually fine June, the rainfall being more than an inch under the average of 30 years. Mean temp. slightly under the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Rainfall about one-eighth of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 3·15 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·01	XI.	Rhayader, Nantgwillt ...	5·76
II.	Dorking, Abinger Hall .	1·18	,,	Lake Vyrnwy	6·51
,,	Birchington, Thor	1·39	,,	Corwen, Rhug	3·76
,,	Hailsham	1·45	,,	Criccieth, Talarvor	5·31
,,	Ryde, Thornbrough	1·70	,,	I. of Man, Douglas	5·99
,,	Emsworth, Redlands ...	1·45	XII.	Stoneykirk, Ardwell Ho.	3·60
,,	Alton, Ashdell	1·39	,,	New Galloway, Glenlee	5·66
III.	Oxford, Magdalen Col..	1·09	,,	Moniaive, Maxwelton Ho.	3·84
,,	Banbury, Bloxham	·97	,,	Lilliesleaf, Riddell	2·08
,,	Northampton, Sedgebrook	1·06	XIII.	N. Esk Res. [Penicuick]	3·75
,,	Duddington [Stamford].	1·18	XIV.	Glasgow, Queen's Park..	3·37
,,	Alconbury	·89	XV.	Inverary, Newtown	5·63
,,	Wisbech, Bank House...	1·69	,,	Oban, The Corran	4·55
IV.	Southend	·94	,,	Islay, Gruinart School ...	2·43
,,	Harlow, Sheering..... ...	1·16	XVI.	Dollar.....	3·87
,,	Colchester, Lexden	·93	,,	Balquhidder, Stronvar...	5·82
,,	Rendlesham Hall	1·05	,,	Ballinluig	2·65
,,	Rushall Vicarage	1·82	,,	Dalnaspidal H.R.S.....	4·72
,,	Swaffham	1·56	XVII.	Keith H.R.S.....	2·58
V.	Salisbury, Alderbury ...	·80	,,	Forres H.R.S.	1·43
,,	Bishop's Cannings	1·10	XVIII.	Fearn, Lower Pitkerrie..	1·10
,,	Blandford, Whatcombe .	·91	,,	N. Uist, Loch Maddy ...	3·97
,,	Ashburton, Holne Vic...	4·38	,,	Invergarry.....	3·60
,,	Okehampton, Oaklands.	3·01	,,	Aviemore H.R.S.	2·25
,,	Hartland Abbey	3·03	,,	Loch Ness, Drumnadrochit	2·87
,,	Lynmouth, Glenthorne.	3·80	XIX.	Invershin	3·11
,,	Probus, Lamellyn	3·48	,,	Scourie	...
,,	Wellington, The Avenue	1·52	,,	Watten H.R.S.....	1·77
,,	Wincanton.....	1·21	XX.	Dunmanway, Coolkelure	9·65
VI.	Clifton, Pembroke Road	2·06	,,	Cork, Wellesley Terrace	4·86
,,	Ross, The Graig	1·87	,,	Killarney, Woodlawn ...	6·25
,,	Wem, Clive Vicarage ...	1·96	,,	Caher, Duneske	5·38
,,	Cheadle, The Heath Ho.	2·99	,,	Ballingarry, Hazelfort...	5·31
,,	Worcester, Diglis Lock	1·61	,,	Limerick, Kilcornan ...	4·72
,,	Coventry, Priory Row ..	1·50	,,	Broadford, Hurdlestown	5·60
VII.	Grantham, Stainby	·97	,,	Miltown Malbay	6·53
,,	Horncastle, Bucknall ...	1·98	XXI.	Gorey, Courtown House	4·71
,,	Worksop, Hodsock Priory	2·02	,,	Athlone, Twyford	4·42
VIII.	Neston, Hinderton	2·78	,,	Mullingar, Belvedere ...	5·21
,,	Southport, Hesketh Park	4·74	,,	Longford, Currygrane...	4·14
,,	Broughton-in-Furness ...	8·43	XXII.	Woodlawn	4·58
IX.	Ripon, Mickley.....	1·54	,,	Crossmolina, Enniscoe ..	3·94
,,	Melmerby, Baldersby ...	1·53	,,	Collooney, Markree Obs.	3·72
,,	Scarborough, Observat'y	2·48	,,	Ballinamore, Lawderdale	4·28
,,	Middleton, Mickleton ...	2·11	XXIII.	Warrenpoint.....	4·49
X.	Haltwhistle, Unthank...	2·67	,,	Seaforde.....	3·52
,,	Bamburgh	2·26	,,	Belfast, Springfield	3·22
,,	Keswick, The Bank	7·00	,,	Bushmills, Dundarave..	2·35
XI.	Llanfrechfa Grange	4·44	,,	Stewartstown	2·64
,,	Llandovery	4·46	,,	Killybegs	4·67
,,	Castle Malgwyn	4·64	,,	Lough Swilly, Carrablagh	2·74
,,	Builth, Abergwesyn Vic.	7·43			

NOVEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours Dpth	Greatest Fall in 24 hours Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·05	— 1·61	·31	27	14	59·1	18	28·0	26
II.		Tenterden ...	1·07	— 2·32	·28	27	17	60·0	14*b*	25·0	26
,,		Strathfieldsaye ...	...	...	...	...	...	...	...	...	...
III.		Hitchin ...	1·13	— 1·55	·31	28	12	58·0	14*a*	27·0	25
,,		Winslow (Addington) ...	1·25	— 1·68	·26	28	14	59·0	14	27·0	19
IV.		Bury St. Edmunds (Westley)	1·09	— 1·46	·24	27	10	58·0	13	29·0	26
,,		Norwich (Brundall) ...	1·54	...	·41	28	16	60·2	14	29·6	26
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	1·25	...	·24	14	12	60·3	18	34·0	30
,,		Polapit Tamar [Launceston]..	2·70	— 1·64	·47	28	12	62·8	1	25·8	6
VI.		Stroud (Upfield) ...	1·72	— 1·61	·57	27	16	58·0	13*c*	31·0	29
,,		ChurchStretton(Woolstaston)	2·02	— 1·50	·37	28	14	57·0	9, 11	30·0	16
,,		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	1·32	...	·24	14	20	...	...	...	...
,,		Boston ...	1·58	— ·62	·35	28	12	58·0	20	30·0	11
,,		Hesley Hall [Tickhill]...	1·94	— ·08	·68	30	16	58·0	12*d*	29·0	23
VIII.		Manchester(PlymouthGrove)	4·20	+ 1·20	1·36	30	14	61·0	1	32·0	...
IX.		Wetherby (Ribston Hall) ...	1·06	— 1·01	·40	14	11	...	...	...	...
,,		Skipton (Arncliffe) ...	5·78	— ·97	·95	28	17	...	...	...	...
,,		Hull (Pearson Park).	2·58	+ ·57	·69	30	14	58·0	13*e*	28·0	16
X.		Newcastle (Town Moor) ...	1·67	— ·73	·38	14	14	...	...	...	...
,,		Borrowdale (Seathwaite)...	20·85	+ 6·06	8·03	12	15	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	3·28	— 1·63	·81	12	13	...	...	...	...
,,		Haverfordwest ...	5·06	— ·80	1·14	12	18	60·0	1	31·0	19
,,		Aberystwith (Gogerddan) ...	5·58	+ ·47	1·27	26	14	61·0	1	...	...
,,		Llandudno...	4·66	+ 1·57	2·43	30	11	63·0	1, 9	35·0	15
XII.	SCOTLAND.	Cargen [Dumfries] ...	4·50	— ·06	1·26	12	14	59·4	1	26·0	15
XIII.		Edinburgh (Blacket Place)...	1·97	...	·41	12	16	57·3	12*d*	27·3	16
XIV.		Colmonell ...	4·34	...	·78	12	12	60·0	2	24·0	3
XV.		Lochgilphead (Kilmory).....	4·36	— 2·93	·69	27	17	...	...	26·0	14
,,		Mull (Quinish)...	4·05	— 2·94	·79	11	19	...	...	...	...
XVI.		Loch Leven Sluices ...	2·90	— 1·06	·90	13	11	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·85	— ·85	·45	12	16	57·9	12	24·1	16
XVII.		Braemar	2·23	— 2·35	·54	28	13	55·0	12	11·6	16
,,		Aberdeen (Cranford)	1·95	...	·60	14	19	60·0	19	20·0	15
,,		Cawdor (Budgate) ...	2·44	— ·41	·63	13	15	...	...	...	...
XVIII		Strathconan [Beauly] ...	4·15	— 2·41	·80	22	14	...	...	...	...
,,		Glencarron Lodge...	9·25	...	1·47	13	20	57·0	8	19·8	16
XIX.		Dunrobin ...	2·01	— ·82	·60	28	14	56·0	19*e*	28·0	16
,,		S. Ronaldsay (Roeberry).....	4·35	+ ·93	·81	13	22	54·0	12	30·0	15
XX.	IRELAND.	Darrynane Abbey...	7·25	...	1·97	16	16	...	...	...	...
,,		Waterford (Brook Lodge) ...	6·81	+ 3·14	1·25	24	15	60·0	8	31·0	16
,,		O'Briensbridge (Ross) ...	7·63	...	1·34	30	14	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	4·59	+ 1·53	·70	13*a*	16	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·42	+ ·59	·94	13	14	60·9	12	34·0	15
XXII.		Ballinasloe	4·33	+ ·42	·69	24	18	58·0	9, 10	27·0	26
,,		Clifden (Kylemore)	6·92	...	1·71	11	16	...	...	...	...
XXIII		Waringstown ...	3·47	+ ·37	·58	26	17	59·0	1	29·0	14
,,		Londonderry (Creggan Res.).	2·88	— 1·64	·66	28	18	...	...	...	...
,,		Omagh (Edenfel) ...	...	...	...	...	...	...	...	...	...

+ Shows that the fall was above the average ; — that it was below it.

a—and 17. *b*—and 18. *c*—and 14. *d*—and 13. *e*—and 20. *f*—and 23. *g*—and 16.

METEOROLOGICAL NOTES ON NOVEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Another very dry month, the total R being the least in November during 35 years, except ·58 in. in 1871, ·79 in. in 1879, and 1·03 in. in 1867. Partial drought for 45 days ended on 13th. Flowers, such as calceolarias, heliotrope, marigolds, &c., blooming fully till cut by frost of 26th. Two days with temp. above 60°. Duration of sunshine 69 hours. Fearful W. and N.W. gale on 28th and 29th. Fog all day on 9th and 23rd.

ADDINGTON.—Very little R until the end of the month. Fogs rather frequent, and sometimes dense, as on the 22nd and 23rd. High winds on the 28th, 29th, and 30th. On the 28th much lightning at night. On the 30th a very heavy R and H storm at 6 p.m., lasting about five minutes.

BURY ST. EDMUNDS, WESTLEY.—Mild and dry, with no frost till the 27th, tender plants remaining in bloom till that date. Very severe gale at night on 29th and on 30th; much damage to stacks, &c.

NORWICH, BRUNDALL.—Total R 1·25 in. below average. A very mild month. Mean temp. 45°·2. The gale on 28th and 29th was exceedingly severe from N.W., lasting nearly 24 hours, although not so destructive as that of March, 1895, when all the damage was wrought in about three hours. Much damage was done on the coast by the extraordinary high tide blown up by the gale, which is said to be the highest tide on the Norfolk coast within living memory. Generally dry, with high bar., bright days at times, but generally much cloud, and considerable fog at times.

TORQUAY, CARY GREEN.—Rainfall 2·79 in. below the average. Total rain of the eleven months, 29·12 in., being 1·90 in. below the average. Mean temp. 49°·4, or 2°·3 above average. Duration of sunshine 33 hours 55 minutes, being 30 hours 10 minutes below average; 15 sunless days.

POLAPIT TAMAR.—Generally a dry month, but the last four days were wet, stormy, and cold. Fog on seven days; half a gale from S.S.W. on 13th, and from N.W. on 28th, with H and T at 11 p.m. Stormy, with heavy H on 30th.

WOOLSTASTON.—Another warm, dry month, the nights especially warm. Severe gale on 28th, with L, and a little S, the remainder of the month was very stormy. Mean temp. 44°·8.

ROTHERBY HALL.—On the whole November was a dry month, with ·74 in. less R than the average. The force of the wind varied from calm to a full half gale. The weather was very changeable, some days being bright, but more than half their number were dull. Fog on 10 days, sometimes dense.

HULL, PEARSON PARK.—Fog on 8 days, dense on 9th and 11th. TS with H, and stormy at night on 28th. H on 29th.

SEATHWAITE.—On 8 days the R exceeded an inch, while on the 12th 8·03 in. fell, causing a flood.

WALES.

HAVERFORDWEST.—Fine weather prevailed during the first six days, with some hoar frost, and partially clear sky; foggy, misty, damp weather succeeded, and continued to the 11th, when a moderate to fresh gale sprang up, culminating in a heavy rainfall, 1·92 in. falling in 24 hours, on 12th and 13th. Weather of a foggy, misty character prevailed throughout the remainder of the month, with an occasional frost at night, and from the 26th to the end it was very stormy and unsettled, with much rain. A vessel was wrecked in Fishguard Bay. Abundance of grass resulting from the unusual mildness.

ABERYSTWITH, GOGERDDAN.—Very stormy in the last week of the month.

LLANDUDNO.—A remarkably fine month for November, the amount of sunshine recorded being 72·8 hours. Stormy, with L and H at night on 28th, and wet and stormy on 30th, when 2·43 in. of R fell, mostly between noon and 2 p.m.

SCOTLAND.

CARGEN [DUMFRIES].—Dry weather continued until the 7th, and during 20 days, 18th October to 6th November, no R fell. Mean temp. 3°·0 above the average, exceeded only in 1876, 1881, and 1894, during 38 years. On only two days, 15th and 16th, did the temp. fall below 32°, while on the night of the 20th the min. was 50°. Upwards of half the total R fell during the four days 11th to 14th. The total for the eleven months of the year is only ·25 in. less than the average. A feature of the month was the remarkable absence of sunshine, the number of hours registered being only 31, against the average of 79. Easterly winds, mostly light, prevailed on 16 days, somewhat unusual in November. The mild open weather was exceptionally favourable for farm stock, pastures looking fresh and green. L in evening of 28th.

EDINBURGH, BLACKET PLACE.—Mean temp. 45°·6, the only warmer Novembers since 1764 being 1818, 1881, and 1894, with mean temps. of 46°·7, 46°·3, and 46°·0, respectively. The mean of the minima was 41°·8, the highest since 1857, when the average was 41°·9. Barometric pressure ·295 in. above average, a value exceeded since 1770 in the Novembers of 1805, 1857, 1867, 1879, and 1896. Dense fog on 11th. Strong N.E. wind, with H and S on 14th. Strong gale, with sleet and S on 28th.

COLMONELL.—Rain ·91 in. below, and mean temp. 4°·9 above, the average for 21 years.

BRAEMAR.—A month more like summer than autumn.

ABERDEEN, CRANFORD.—The month was very warm, the min. temp. on several nights being above 45°, and on the 12th 50°. Little sunshine. A heavy gale from N.N.W. on 28th and 29th.

S. RONALDSAY, ROEBERRY.—The first half of the month was very good, the latter cold and wet. Mean temp. 44°·3, or 1°·3 above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—Excepting the last week, a very mild month, some days quite summer-like. Although the total R is high, 7·25 in., yet the number of rainy days is not large; 5·56 in. of R fell in 8 days between 9th and 17th, leaving 1·69 in. for the rest of the month. N.W. gale and H on 30th.

WATERFORD, BROOK LODGE.—The weather was so mild that the following plants were in bloom in the garden up to the end of the month—nasturtiums, gentia, clematis, primroses, poppies, heliotrope, and roses. Gale from S.E. on 7th, and from W. on 30th. L on 29th.

O'BRIENSBRIDGE, ROSS.—The first week was beautiful, and there were some very fine days in the middle of the month, which closed with fierce rain storms, T and L.

DUBLIN, FITZWILLIAM SQUARE.—A dull, mild, foggy month on the whole, mean temp. 48°·6, or 3°·9 above the average. High winds were noted on 11 days, but attained the force of a gale only on the 28th. Fogs on 11 days. Lunar halos on the 8th and 29th. H, sleet and S fell in the gale on the 28th, when also L was seen.

KYLEMORE HOUSE.—Gale and R on 26th. Stormy, with W. wind on 27th, and the severest gale of the season on the 28th.

[No. CCCLXXXIV.]
Vol. XXXII.

[PRICE FOURPENCE.
Or 5s. per annum post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	Page
Warren Tambra	181
November 28th, 1897	181
ns	185
eorological Society	186
Tabeller for Norge	187
r Currents	188
in Scotland	190
ter Nights	190
al Table for the British Empire, July, 1897	192
ary Table of Rainfall, December, 1897	193
Temperature in December, 1897, at 50 Stations	194
al Notes on December, 1897	195

JANUARY, 1898.

LONDON: EDWARD STANFORD,
COCKSPUR STREET, CHARING CROSS, S.W.

SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy
Meteorological Societies, and of the British Astronomical Association; Artic
by various eminent Astronomers, English, American, and Continenta
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assista
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu
publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observato
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 1

NOTICES.

It is requested that all Books for Review, and Communications
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in
letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIV.] JANUARY, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

Joseph Warren Zambra.

1822-1897.

JUST at the close of the year we have to announce, with regret, the death of Mr. Zambra, the last of the trio to whom—especially in the period 1850-1870—we are chiefly indebted for the excellent instruments now used at meteorological stations. Mr., or to give him his proper title, Cavaliere Negretti, passed away first, and now in 1897 we have lost both Mr. Casella and Mr. Zambra. Happily—though perhaps no one ever surpassed Negretti as a glass blower—they have all imparted much of their knowledge to their successors, and all have left sons to, we hope, worthily follow in their fathers' footsteps.

GALE ON NOVEMBER 28TH, 1897.

UNDER this title we gave last month some remarks contrasting the proportion of damage due to wind force and wave action, and stated that "The mischief was due to tidal action rather than to that of wind." We then little thought what excellent data upon the subject were being collected, but on the very day that the *Met. Mag.* was published an excellent account of the flooding appeared in the *Engineer* of December 17th, 1897, signed by Mr. Wheeler, C.E. of Boston, probably the most competent authority in the world.

Now, thanks to Mr. Wheeler's kindness, we are able to offer to our readers what may, perhaps, be regarded as a second edition of the report, with such additions as Mr. Wheeler received after that in the *Engineer* had been printed.

In our own little note we made one incorrect statement, and we are glad that it has been detected, because it shows how sharply our words are watched, and it keeps us up to the mark. We said that the mischief was due "to the intensity of the storm occurring at nearly the time of high water spring tide." Happily the spring

tides had passed four or five days, or the damage would have been, as Mr. Wheeler says, "even more serious." We fell into the error through knowing that as an actual fact the level reached was much above that of "high water spring tide," but the cause was wind, rather than tide.

THE NOVEMBER GALE AND THE TIDES.

By W. H. Wheeler, M. Inst. C.E.

The subject of the effect of the wind and atmospheric pressure on the tides was brought before the British Association at the Ipswich meeting in 1895, in a paper read by me, and in the following year at Liverpool, a report on the same subject was presented by a committee which had been appointed to investigate the matter. With the aid of information kindly furnished to me in reply to my inquiries from the harbour masters of several ports round the coast, I am able to supplement the information already given, by the following account of the effect on the tides of the gale of November last.

The severe gale of the 28th and 29th of November, which caused such serious damage all along the south-east coast of this country, had the effect of raising the tide to an abnormal height, the tide of the following day being considerably depressed. The wind appears to have had the greatest effect in increasing the height of the tide along the part of the coast extending from the Humber to the east end of the English Channel. The wind on the previous days had been blowing strongly from the south-west, a condition favourable to increasing the height in the Channel; it then flew round to the north-west, a quarter which always raises the tide in the North Sea. The combined influence of the winds from these two opposite quarters would therefore tend to concentrate the full effect of the tide along the south-eastern coast, and the records of the damage done to the cliffs and in flooding, owing to the water breaking through or flowing over the banks, and doing other damage, show that this was the case. Fortunately, the gale occurred five days after the full moon, or the effect would have been even more serious.

On Saturday, the 27th, round the south and east coasts the wind was blowing all day strongly from the south-west, the force varying, according to the different reports received, from 5 to 7 of the Beaufort scale; the barometer varying from 29·92 in. at Spurn Point, to 30·13 in. at the North Foreland. On Sunday the barometer had fallen to 29·49 at Spurn and 29·76 at the North Foreland, continuing to fall to 29·10 towards Monday; the wind blowing from the north-west with force of 10, veering to south-west on Tuesday, with force of 3 to 6. New moon was on the 24th, so that the spring tides were falling off. Under these conditions the effect of the gale in raising and depressing the tide was as follows:—

At Sunderland the increase from the computed normal height was 2ft. 10in., and at Tynemouth 2ft. 4in.

At Spurn the water washed over the lifeboat cottage and inn, and carried away a great part of a large chalk and timber groin constructed for the protection of the point.

At Grimsby the morning tide of the 29th rose 5ft. 11in. above the calculated height, the next day's tide being 1ft. 9in. less, the actual difference in height between the two tides being 8ft. 9in. At Hull the tide was 5ft. 3in. above the normal height.

At Cleethorpes, at the mouth of the Humber, at high water the tide swept the Promenade from end to end, and carried away the whole of the sea defences which have recently been constructed for the protection of the town and land.

At Mablethorpe, and lower down the Lincolnshire coast to Skegness, the tide did considerable damage to the sand dunes, in some places running over the banks and flooding the land and gardens behind, and doing an immense amount of damage to bathing machines, boats, and the promenades.

In the Wash the morning tide rose 5ft. 3in. above the calculated height at Boston Dock, the difference between this tide and that of the following day being 8ft. 8in. At Lynn the increase was 7ft., the difference between the two tides being 11ft. 11in., the effect of the wind from the north-west being more felt here than on the other side of the Wash, a large amount of damage was done in the flooding of houses and granaries, in some cases the water rising 4ft. above the floors. A portion of the permanent way of the Hunstanton Railway was washed away owing to the tide flowing over the banks near Heacham, and traffic was stopped.

At Holme, Thornam, Burnham, Cley, and Blakeney, the sea banks which enclose the Marsh land were overflowed and broken, and were injured to an extent requiring several thousand pounds to reinstate them. The lands were flooded, and the houses of the inhabitants submerged; at the village of Salthouse the lower rooms of 90 houses having been submerged.

At Wells also the water found its way into the houses and shops.

At Sheringham, Cromer, and Mundesley great damage was done to the cliffs; and at Palling the high tide carried away several feet of the sand hills.

Between Winterton and Happisburgh the sand hills were clean cut down from five to twelve yards.

Owing to the height of the tide the salt water was driven for an unusual distance up the rivers which run through the Broads, killing great numbers of fresh water fish.

At Horsey Gap, several breaches were made in the sea bank, through which the tide poured and inundated the land at the back.

All along the coast from the Wash to the Thames the tide was abnormally raised, the increase at Yarmouth being 8ft., or 2ft. more than the full rise of a spring tide, the difference between this and the tide of the following day being 9ft. 3in. The quays, marine drive, and the beach garden at Yarmouth were all flooded.

At Lowestoft some of the principal streets of the town were flooded, the masonry of the esplanade was broken down, and the embankment of the railway so damaged at Oulton that traffic had to be suspended.

At Harwich the water broke over the sea bank, carrying a laden barge through a breach into the street. Nearly 300 cottages were flooded to a depth of 6ft.

At Aldeburgh a large breach was made in the sea wall, the land and houses were inundated, and the permanent way of the railway was undermined.

At Ipswich the increase on the tide of the day was 6ft. 6in. An immense amount of damage was done all along this part of the coast by the breaking down of the cliffs.

At the mouth of the Thames the damage done by the high tide and gale was greater than on any other part of the coast.

The banks of Canvey Island suffered considerably, a large area of the enclosed land being flooded. The tide flowed over the bank from Leigh to Pitsea Island and also that at Purfleet, inundating the land behind, and also the houses in the village of Leigh.

Tilbury Marshes and the whole of the lower part of Grays were inundated to a depth of several feet, and the Tilbury Railway was under water in several places.

At Gravesend, the tide rose to 3ft. 4in. above Trinity high-water mark, or within 5in. of the great tide of 1881, the highest on record, the difference in height between this and the tide of the next day being 7ft. 5in. At the Victoria and Albert Dock it was 4ft. 5in. above the expected height, the following tide being 1ft. 11in. less than expected, the actual difference in height between the two tides being 7ft. 4in.

In London the water was nearly level with the top of the parapet of the Embankment and the footway was flooded. The Custom House Pier and several of the low-lying streets, both on the east and west sides of the river, were flooded, in some cases knee deep. Many basement floors were completely submerged and the cellars filled with water. Even up the river as high as Richmond the tide flowed over the towing path and the Twickenham Embankment.

At Blackfriars Bridge the tide rose to 4ft. 9in. above Trinity high water mark, and at Hammersmith to 4ft. 6in.

At Woolwich, where the Arsenal wharves are 4ft. above high water of spring tides, the water flowed over them, and it was only by the help of a great number of troops who were called out to assist, that a large amount of ammunition and stores placed ready for shipment was saved from destruction. The greater part of the Arsenal was flooded, and the fires in the boilers belonging to the electric light plant extinguished.

At Chatham considerable damage was done by floods, and at Rochester the gas works were inundated to a depth of 8ft. Between Sheerness and Queenborough the land was flooded, the water flowing over the railway into Blue Town, flooding the streets and filling the lower floors of the houses, from which the inhabitants had to be removed by boats. The tide broke over the dockyard wall and flooded all the lower portions of the yards and the basement of the Royal Naval Barracks to a depth of 8ft.

At Sheerness the water was 2ft. deep in the streets, and a large area of land in the neighbourhood inundated, the seawall near Scrapsgate having given way. The sewage outfall at West Minster was flooded and the pumping operations stopped ; the railway line was also flooded. At Whitstable the tide overflowed the banks two hours before high water and swept across the Salts, carrying with it fences and storehouses, and breaking into the dwelling-houses. Some of the houses were under water to a depth of 8ft., and the High Street was from 3 to 4ft. under water. At Sittingbourne also great damage was done to the river wall, the water flowing a distance of two miles inland ; great numbers of sheep and cattle were drowned.

The lower parts of Margate and of Herne Bay were inundated, and the houses filled with water.

At Broadstairs the old pier was submerged and considerbaly damaged.

The river Stour overflowed its banks and flooded the main streets of Sandwich ; the marsh land for nearly two miles inland was inundated, including

the golf links, and vehicular traffic along the main road between Sandwich and Ramsgate had to be suspended.

At Deal the water rose above shore level and flooded the streets and houses, considerable damage being done to the sea wall at the north end of the town.

At Dover the afternoon tide of the 29th rose 6ft. 1in. above its proper height, there being a difference of 8ft. between this tide and that of the next day.

At Newhaven the increased range of the tide was about 2ft. 4in., and at Portsmouth only 1ft. 8in. on the afternoon of the 29th.

The above is only a partial record of the immense extent of the damage done, the most serious amount of flooding perhaps that has been recorded, but it is sufficient to show the extent to which the tide may be influenced by gales of wind.—*Engineer*, December 17th, 1897.

FROMONDUS.

In our number for August we gave a list of the editions of Fromondus's six books on Meteorology, known, or reported to us; three others have been mentioned since, either in these pages or in those of *Ciel et Terre*. It seems to us that it may be well to sum up the facts as far as at present ascertained.

It appears that Prof. Monchamp's quotation of an edition dated 1655 was a mistake for 1656—so that is disposed of.

M. Lancaster, relying upon the *Biographie Nationale*, published by the *Académie des Sciences de Belgique*, quoted* one of 1634, and in *Ciel et Terre* (1897, p. 431) he quoted one of 1631, but in *Ciel et Terre*, on page 503 both Prof. Monchamp and M. Lancaster appear to admit that neither of these editions ever existed.

The hypothetical edition of 1670, which we called F, is disposed of by the printer's signatures (see *Met. Mag.*, 1897, pp. 118 119).

We are not aware what librarians have adopted as the definition of an edition; we think that the prefixing of a new title page, with a fresh publisher's name, or a fresh date, distinguishes one issue from another, but Prof. Monchamp seems to think not, and he (*Ciel et Terre*, 1897, p. 503) treats editions B and D as two issues of one edition. In this he is mistaken. We have both, and not merely do the titles differ, but also the decorated initial letters and the ornamental headlines. Although at first sight it might be held that the body of the work was identical, for the two run word for word, line for line, and page for page; close examination will show that the whole work has been set up afresh, as stated on the title page. In proof of this many differences can be detected, we quote four instances.

	Edition B 1639.	D 1656.
Page 135, line 4, last word	Nam.	N$\widehat{a}$.
,, 153, line 11 from bottom	extrinsecum.	eXtrinsecum.
,, 175, ,, 14 ,, ,,	avertisse.	evertisse.
,, 449, ,, 3 ,, ,,	oculum.	oculu$\widehat{m}$.

* *Met. Mag.*, 1897, p. 118.

The final result is, that our list on p. 118 has, up to the present time, received no augmentations, and the only correction is that F disappears, and E can be called a 4to, although no one looking at it would do so.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 15th, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S, President, in the chair.

The following candidates were ballotted for and duly elected :— Leonard Addenbrooke ; James Diggle, A.M.I.C.E., F.G.S. ; Ernest Romney Matthews, C.E. ; T. T. S. Metcalfe, J.P. ; William Ormerod, J.P.

Mr. R. C. Mossman, F.R.S.E., read a paper on the daily values of non-instrumental meteorological phenomena in London, from 1763 to 1896. The paper summarised records of snow, hail, gales, thunderstorms, fogs, &c., for each day in the last 134 years, thus exhibiting the daily march of the various phenomena throughout the year. Thunderstorms, it was shown, were at their maximum from the beginning of June to the middle of August, the greatest number being recorded in the week ending July 20th. A rapid decline set in at the beginning of August, and very few cases were recorded between October and March. Lightning, without thunder, was essentially a nocturnal phenomenon ; and increased rapidly after the summer solstice. During January fogs were considerably above the average, but they diminished rapidly after the middle of February, falling to a minimum at the beginning of July. A marked increase took place during September, when the autumnal fall of temperature set in. A great many fogs were recorded about the middle of October, but the maximum extended from November 5th to 24th. This applied also to the density of fogs, as during the above period no less than 27 per cent. of all the fogs recorded were designated "thick," or "dense." At the end of November fogs diminished both in number and in density, only 15 per cent. being recorded as "dense" in the fortnight ending December 8th. Snow was at its maximum at the beginning of January, but the values at the beginning of March were also high. There was a curious increase in snowstorms about the middle of April, and an equally marked decrease at the beginning of December. The increase in April took place at the time of "the borrowing days," (new style) while the diminution in December was associated with the occurrence of a mild stormy period, which recurred from year to year at the beginning of that month, with few exceptions. Storms were most frequent at the end of January, and at their minimum in August. With regard to the occurrence of equinoctial gales it was shown that storms diminished rapidly before, during and after, the vernal

equinox. During the second half of September a rapid increase took place, which rather supported, than otherwise, the popular opinion regarding gales at the autumnal equinox. On closer inspection it was seen that this period might be said to mark the termination of the tranquil summer conditions rather than the commencement of very stormy weather, which characterised the four months November to February.

Mr. W. Marriott read a paper on "the Rainfall of Seathwaite, Cumberland." This place has long been noted for its heavy rainfall, being, in fact, one of the wettest spots in the British Isles,—the average yearly amount is 137 inches. The spring months of April, May and June, are the driest, as they not only have the least rainfall, but also the least number of rainy days. August has the greatest number of rainy days. The heavy nature of the rainfall may be gathered from the fact that 21 per cent. of the falls are above 1 in., 2 per cent. being above 3 in. The greatest fall in one day was 8·03 in., on November 12th, 1897. The author has investigated the atmospheric conditions under which the heavy rainfalls occurred, and he finds that they are due to the direction and force of the wind. When the wind is blowing strongly from the south-east, or south-west, it will be concentrated in the valleys on the windward of Scafell, and rush up them with considerable force, the air current consequently being projected to a considerable altitude beyond Scafell. Owing to the reduction of temperature with elevation, the air parts with a great deal of its moisture, which falls as rain. With such a process going on continuously for a whole day, the heavy rainfall at Seathwaite is fully accounted for.

REVIEW.

Klima-Tabeller for Norge, of H. Mohn. II. Lufttryk. III. Luftens Fugtighed. Christiania. 1896 and 1897. Two parts, large 8vo, 80 pp. and 12 pp.

We had the pleasure of noticing the first part of Prof. Mohn's excellent summaries of Norwegian meteorology, on p. 43 of our last volume; that dealt with temperature, the two parts now before us deal respectively with pressure, and with humidity.

As there are doubtless other parts to follow, we take this opportunity of expressing the hope that, before completing this valuable monograph, Dr. Mohn will give a map of the stations,—we are aware that he gives full particulars as to the lat. and long. of each, but it would be much more handy to have in the book itself a sketch map showing their distribution.

II. Lufttryk (Pressure). This is, like all Dr. Mohn's work, a thoroughly practical, well arranged, and nearly complete treatise,—we say nearly complete because some diagrams would add to its value. The first section gives full details as to the barometers used

at the central station, and a history of all the comparisons made between them and the standards at Kew, Greenwich, Paris, and other places. Then follows a life history of the barometers at 46 other stations. After this we have a specimen of the process adopted for completing short period records, a list of the stations with lat., long., altitude, beginning, ending and duration of the record, and particulars as to the normal stations, whence (if the record does not cover the whole of the 25 years, 1866-90) the values have been completed. Table II. gives for each station the mean pressure for each month, and for the year, on the average of 25 years. But we cannot go through all these excellent tables, in which apparently nothing has been forgotten. We must pick out one or two facts and pass on. Apparently the greatest and the least mean annual pressure at sea level are—

	in.	
Greatest.....	29·928 at Tonset,	in Lat. 62° 17′ N., Lon. 10° 45′ E.
Least.....	29·768 at Gjesvær,	,, 76° 6′ N., ,, 25° 22′ E.

The individual extremes reduced to sea level are given by Dr. Mohn as—

	in.	
Highest..	31·174 on Feb. 6th, 1895, at Vardø,	Lat. 70° 22′ N., Lon. 31° 8′ E.
Lowest..	27·760 on Jan. 27th, 1884, at Bergen,	,, 60° 23′ N., ,, 5° 21′ E.

III. Luftens Fugtighed (Humidity). This subject is treated very similarly to the Pressure, we need, therefore, say only a few words as to the results. As regards vapour tension, the maximum at all stations is in July *or* August, and most generally in July ; the minimum is at all stations in January, February, or March, and most generally in February. The relative humidity is at its maximum at nearly every station in one of the four months August to November, the minima are spread over the spring months February to June.

Some marvellously low values are reported as the extremes of relative humidity ; an entry of 3 at Vardø has a ? but there is 8 at Christiania, and 10 is reported from Domaas, Lærdalsøren, Brønø, and Bodø, and 11 or 12 at many stations. After that who will say that Norway is always damp ?

INCLINED AIR CURRENTS.

To the Editor of the Meteorological Magazine.

SIR,—It may interest you, and through you some of the readers of the *Meteorological Magazine*, to know that it is easy to observe the vertical component of the motion of the wind by means of a simply constructed wind vane, and that quite a new field of interesting investigation is thus opened up.

The vane I have constructed is of $\frac{5}{8}$ inch brass rod. At one end two saw cuts have been made, each at a right angle to the other, in the direction of its length, and in them are fixed two circular sheets

of brass, 6 inches diameter, intersecting at a right angle ; the vane is altogether about 2 ft. long. It is pivoted at its balancing point in a metal support, which is fixed in a short length of brass tube, and rests on a metal point, fitting easily into this tube, so as to allow it, with the vane, to revolve in the horizontal plane freely, and the pivot allows it to oscillate, within limits, fixed by springs, of about 35° up or down from the horizontal. Placed at a height of about 50 ft. above the ground, it indicates the direction of the wind truly, both horizontally and vertically.

My observations hitherto made seem to indicate that strong winds sometimes blow at inclinations as great as at least, 30° above or below the horizontal, and that whether these comparatively steady inclinations are themselves parts of atmospheric waves or not—more rapid waves are very general. These observations, if verified, seem to be important to architects, engineers, and those who are endeavouring to work out the problem of a flying machine. One can notice how a bird, with its beautiful living organism adapted to its environment, can utilise these air waves in its soaring flight ; but I fear that they will sorely disturb the equilibrium of any machine launched in the free air.

One observation, in the calm centre of a great cyclone of moderate intensity, seemed to indicate a steady, moderate, upward motion of the atmosphere there, replenished presumably from all sides below. This evidently is a very different thing from the violent upward motion in the centre of a small whirlwind. Generally there appears to be an upward motion in the centre of a V depression, and vice versa. The mechanism of land and sea breezes, with their upward and downward motions is well shown.

I am sure that a very wide field of investigation in connection with variations in barometric readings, influenced by upward or downward movements of the atmosphere, is open to any observers who provide themselves with simple instruments of this sort, and place them in open situations, at, I suppose, not less than 30 ft. above the surface of the ground.

I send you this short sketch of my early enquiries in this direction in the hope that if publicity be given to the subject, many meteorologists may be led to give their attention to it, and that combined observations, with good instruments, may largely increase our knowledge.

I am, sir, faithfully yours,

H. SCHAW,
Major-General, R.E., C.B.

Aurora Terrace, Wellington, New Zealand.
27th October, 1897.

[General Schaw's letter has come so far, and is in many respects so interesting, that we gladly insert it, and think it not improbable that some of our correspondents may take up the subject. The

General's instrument is evidently very inexpensive, but it produces no record. The first instrument, not merely to show, but to record, the inclination of the wind, was brought out by Dalberg, in 1780; those by Benzenberg, Cacciatore, Hennessy, and Dechevrens, are described by Professor Laughton in his "Historical sketch of anemometry." (*Quar. Jour. R. Met. Soc.*, VIII., (1882) pp. 174-175). We have an impression that an indicator of inclination was attached to the Atmospheric Recorder constructed by Mr. G. Dollond, for Mr. H. Lawson, and erected at Nottingham, but in neither of the descriptive pamphlets prepared by Mr. Dollond is there any reference to the subject. The last and most elaborate effort in this direction was made by Mr. L. M. Casella, and is described and illustrated in the *Quar. Jour. R. Met. Soc.*, XII., (1886) pp. 246-253.

The great cost of most of the recording patterns is an obstacle to their introduction, and most of them must be placed on piers or buildings which necessarily produce deflections in the very currents, the inclination of which they are intended to measure. We are therefore disposed to think that systematic observation of General Schaw's pattern, mounted on a very tall pole, would give more trustworthy results than any of the recorders.—ED.]

KITE FLYING IN SCOTLAND.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the notice in the current issue of *Met. Mag.*, *re* Scientific Kite Flying, it may be of interest to state that several experiments with kites of the Blue Hill pattern have been made here during the past two months. No instruments have as yet been sent up, but we hope to have the ingenious apparatus of M. Richard at work soon. The trials have been carried out under the direction of Mr. John Anderson (late of Owensboro, Kentucky), and have, on the whole, been successful. An improved hand winch is at present under construction, which, with the substitution of piano wire for cord, will, we hope, yield satisfactory results.

I am, Yours very truly,

R. C. MOSSMAN.

10, Blacket Place, Edinburgh, Jan. 4th, 1898.

WARM WINTER NIGHTS.

To the Editor of the Meteorological Magazine.

SIR,—I think that the high minimum temperature of the night of December 17th, 1897, should not pass without notice. On the morning of the 18th I recorded 53°·2 in my Stevenson screen, and

52°·7 in the old screen, as the lowest temperature of the preceding 24 hours; both are verified thermometers. I had only one other minimum equalling 50°·0 in the nineteen Decembers from 1878 to 1896 inclusive, viz.: 50°·8 on December 4th, 1889. In the "Greenwich Met. Obs.," Part III., Temperature 1841–1890," there is no minimum in December exceeding 52°·0; this, therefore, seems to have been most exceptional.

While on the subject of high minima, permit me to point out what appears to be an error on p. 116, Vol. 28 of the *Met. Mag.* I find in the above Greenwich records that 60°·0 was the minimum on August 8th, 1846, and not 68°·0. The highest recorded at Greenwich during 50 years was 66°·1, on July 26th, 1872; that of August 18th, 1893, is therefore unprecedented since 1841. Again, minima above 60° can hardly be described as *very* rare; at Greenwich they average about four per annum, and in the *Met. Mag.* for September, 1897, p. 123, you state that at Camden Square you have two every August on the average.

Minima above 64° are very rare. Howard records eight in 25 years, the highest being 70° on July 27th, 1814. Mr. *Cowe's Register* records 26 in 46 years. Greenwich only four in 50 years.

Yours very truly,

CHARLES L. BROOK.

Harewood Lodge, Meltham, Dec. 20th, 1897.

[Mr. Brook is right and we were wrong in Vol. 28, but we can plead extenuating circumstances. It is printed (wrongly) in the Greenwich Observations for 1846 as 68°·0, but at that time observations were being taken every two hours, and from them it is obvious that 68°·0 is wrong, and 60°·0 right. We agree with Mr. Brook as to the use of the words "rare," and "very rare," and only think it necessary to add that a consideration of the position of the Rev. J. Cowe's thermometer (see the photo and plan in the volume) will explain the number of high minima recorded by him—the surrounding walls would radiate heat at night and prevent proper cooling. —ED.].

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	83·6	24	44·0	8	75·8	55·3	52·9	68	130·1	36·1	·64	8	4·0
Malta	97·0	15	66·3	31	88·2	71·5	67·0	69	159·7	58·4	·09	2	2·0
Mauritius	78·5	23	59·8	13	75·9	64·9	59·6	71	121·5	50·4	1·50	10	5·2
Calcutta	97·7	3	74·6	14	88·5	78·7	77·8	84	156·3	74·2	13·45	18	7·7
Bombay	89·7	2	73·9	17	84·9	77·7	77·3	87	143·6	73·9	30·19	28	8·7
Ceylon, Colombo	88·2	...	73·0	4	86·5	78·1	73·7	80	139·0	71·0	5·24	22	6·4
Melbourne	66·1	30	34·6	29	57·0	44·5	44·0	78	115·2	26·0	2·45	14	7·2
Adelaide	67·7	17	38·9	28	60·0	46·5	45·8	79	124·2	29·2	1·81	16	6·0
Sydney	66·9	31	41·4	18	60·3	47·6	45·2	82	110·2	29·9	6·58	7	4·2
Wellington	62·0	26	31·0	20	54·8	43·3	39·5	71	105·0	21·0	3·31	20	4·5
Auckland	61·0	14	40·0	3	57·7	46·8	43·1	71	120·0	38·0	5·23	25	6·2
Jamaica, Kingston	92·4	23*a*	70·8	23	89·1	73·5	70·9	71	...	...	1·74	10	6·2
Trinidad	92·0	26*b*	67·0	15	87·6	70·6	73·8	83	167·0	66·0	13·88	23	...
Grenada	86·0	21	70·2	30	83·2	74·6	71·2	75	152·0	...	7·51	22	2·8
Toronto	93·3	5	53·0	15	81·4	63·5	64·1	74	109·4	50·2	5·24	13	4·4
New Brunswick, Fredericton	92·7	8	45·5	4	78·7	55·8	61·4	67	...	...	3·42	12	5·4
Manitoba, Winnipeg	88·5	17	47·0	12	79·0	56·8	...	...	...	...	5·38	14	5·8
British Columbia, Esquimalt	77·7	12	45·1	25	68·2	50·5	51·7	82	...	...	·97	8	4·8

a—and 30. *b*—and 27.

REMARKS.

MALTA.—Adopted mean temp. 78°·4, or 0°·9 above the average. Mean hourly velocity of wind 8·6 miles. Average sea temp. 80°·0. TS on 5th, L on 6th.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 0°·2 above, and rainfall ·76 in. below, their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·3 above average; extremes, 29·1 on 22nd, and 2·0 on 24th; prevailing direction E.S.E.
T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·6, or 1°·1 above, of dew point 0°·3 above, and rainfall ·84 in. above, their respective averages. Mean hourly velocity of wind 10·3 miles; prevailing direction S.W.
H. O. BARNARD.

Adelaide.—Mean temp. 1°·7 above the average of 40 years. Rainfall ·84 in. below average. In the northern agricultural districts the rainfall was generally above the average.
C. TODD, F.R.S.

Sydney.—Rainfall 2·34 in. above, humidity 5·5 above, and temperature 1°·6 above, their respective averages. Heavy general rains fell in continuance of those in June, and a high flood occurred on the Darling.
H. C. RUSSELL, F.R.S.

Wellington.—From 12th to 22nd generally showery, and also at the end of the of the month; the remainder fine. Variable winds, generally moderate. L on 8th, 15th, and 16th, and T and L on 19th. H on 8th, 17th, and 18th. Temp. 1°·4 above, and rainfall 3·03 in. below, the average. Slight earthquake on 8th.
R. B. GORE.

Auckland.—A showery and stormy month, rain being registered on 25 days, and the total nearly ·50 in. above the average. Mean temp. and barometric pressure both slightly above the average.
T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Frequent thunderstorms.
J. F. BRENNAN.

TRINIDAD.—Rainfall 4·43 in. above the average of 30 years.
J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·91	XI.	Rhayader, Nantgwillt ...	11·05
II.	Dorking, Abinger Hall .	4·25	,,	Lake Vyrnwy	8·94
,,	Birchington, Thor	2·63	,,	Corwen, Rhug	5·22
,,	Hailsham	3·51	,,	Criccieth, Talarvor	4·50
,,	Ryde, Thornbrough	3·31	,,	I. of Man, Douglas	5·36
,,	Emsworth, Redlands ...	3·09	XII.	Stoneykirk, Ardwell Ho.	4·48
,,	Alton, Ashdell	5·60	,,	New Galloway, Glenlee	11·81
III.	Oxford, Magdalen Col..	2·28	,,	Monaive, Maxwelton Ho.	10·04
,,	Banbury, Bloxham	3·55	,,	Lilliesleaf, Riddell	4·62
,,	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuick]	5·00
,,	Duddington [Stamford].	2·06	XIV.	Glasgow, Queen's Park..	5·56
,,	Alconbury	1·46	XV.	Inverary, Newtown	9·44
,,	Wisbech, Bank House...	1·45	,,	Oban, The Corran	6·90
IV.	Southend	1·94	,,	Islay, Gruinart School ...	4·16
,,	Harlow, Sheering..... ...	2·70	XVI.	Dollar.....	5·87
,,	Colchester, Lexden	1·77	,,	Balquhidder, Stronvar...	10·94
,,	Rendlesham Hall	1·53	,,	Ballinluig	(4·00)
,,	Rushall Vicarage	2·00	,,	Dalnaspidal H.R.S.....	9·07
,,	Swaffham	1·86	XVII.	Keith H.R.S.....	3·96
V.	Salisbury, Alderbury ...	5·64	,,	Forres H.R.S.	2·28
,,	Bishop's Cannings	3·95	XVIII.	Fearn, Lower Pitkerrie..	2·07
,,	Blandford, Whatcombe .	5·95	,,	N. Uist, Loch Maddy ...	7·11
,,	Ashburton, Holne Vic...	14·46	,,	Invergarry.....	12·26
,,	Okehampton, Oaklands.	9·29	,,	Aviemore H.R.S.	5·41
,,	Hartland Abbey	5·35	,,	Loch Ness, Drumnadrochit	5·77
,,	Lynmouth, Glenthorne.	8·73	XIX.	Invershin	3·64
,,	Probus, Lamellyn	6·77	,,	Scourie	...
,,	Wellington, The Avenue	6·02	,,	Watten H.R.S.....	2·17
,,	Wincanton.....	6·08	XX.	Dunmanway, Coolkelure	10·65
VI.	Clifton, Pembroke Road	4·31	,,	Cork, Wellesley Terrace	4·25
,,	Ross, The Graig	3·60	,,	Killarney, Woodlawn ...	11·85
,,	Wem, Clive Vicarage ...	2·23	,,	Caher, Duneske	4·42
,,	Cheadle, The Heath Ho.	3·75	,,	Ballingarry, Hazelfort...	3·54
,,	Worcester, Diglis Lock	2·57	,,	Limerick, Kilcornan ...	3·87
,,	Coventry, Priory Row ..	2·80	,,	Broadford, Hurdlestown	3·68
VII.	Grantham, Stainby	2·30	,,	Miltown Malbay	7·83
,,	Horncastle, Bucknall ...	2·01	XXI.	Gorey, Courtown House	4·22
,,	Worksop, Hodsek Priory	2·02	,,	Athlone, Twyford	4·48
VIII.	Neston, Hinderton	2·18	,,	Mullingar, Belvedere ...	3·84
,,	Southport, Hesketh Park	2·98	,,	Longford, Currygrane...	5·37
,,	Broughton-in-Furness ...	8·09	XXII.	Woodlawn	5·65
IX.	Ripon, Mickley.....	3·47	,,	Crossmolina, Enniscoe ..	7·78
,,	Melmerby, Baldersby ...	2·81	,,	Collooney, Markree Obs.	4·65
,,	Scarborough, Observat'y	1·52	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	2·92	XXIII.	Warrenpoint.....	4·36
X.	Haltwhistle, Unthank...	4·16	,,	Seaforde..	4·78
,,	Bamburgh	2·25	,,	Belfast, Springfield	5·38
,,	Keswick, The Bank	11·35	,,	Bushmills, Dundarave..	4·64
XI.	Llanfrechfa Grange	7·28	,,	Stewartstown	4·79
,,	Llandovery	7·48	,,	Killybegs	7·07
,,	Castle Malgwyn	8·39	,,	Lough Swilly, Carrablagh	5·61
,,	Builth, Abergwesyn Vic.	14·70			

DECEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·20	+ ·13	·64	7	17	55·9	16	23·7	26	10	17
II.		Tenterden ...	3·28	+ ·65	·70	7	22	54·0	16*b*	21·5	26	10	16
,,		Strathfieldsaye ...	...	...	...	...	...	...	...	...	...	...	...
III.		Hitchin ...	2·32	+ ·29	·48	7	19	56·0	16	22·0	22	12	...
,,		Winslow (Addington) ...	3·07	+ ·62	·57	29	18	58·0	16	20·0	24	14	16
IV.		Bury St. Edmunds (Westley)	1·71	— ·53	·43	7	12	54·0	17	27·0	4	...	...
,,		Norwich (Brundall) ...	1·82	...	·33	7	17	54·2	17	21·2	23	9	20
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	7·16	...	2·14	29	18	56·6	16	32·0	3	1	4
,,		Polapit Tamar [Launceston]..	6·27	+ 2·04	·99	29	22	57·1	16	27·6	3	4	11
VI.		Stroud (Upfield) ...	4·02	+ 1·57	·72	29	18	57·0	16	26·0	22	14	...
,,		ChurchStretton(Woolstaston)	3·63	+ ·58	·58	7	21	55·0	16	26·5	23	11	18
,,		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·65	...	·76	4	21	...	...	...	...	...	...
,,		Boston ...	1·23	— ·62	·32	13	12	54·0	16	22·0	23	14	...
,,		Hesley Hall [Tickhill]...	1·98	·00	·34	7	18	58·0	16	19·0	24	14	...
VIII.		Manchester(PlymouthGrove)	3·72	+ ·28	·92	7	17	56·0	16	25·0	22	12	14
IX.		Wetherby (Ribston Hall) ...	1·02	— 1·42	·31	7	12	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	11·00	+ 4·19	1·56	7	23	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·04	— ·23	·65	13	13	57·0	16*b*	24·0	22*f*	12	15
X.		Newcastle (Town Moor) ...	2·38	+ ·08	·80	7	18	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	20·57	+ 5·76	2·50	29	23	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	6·92	+ 2·37	1·53	7	18	...	...	...	...	...	...
,,		Haverfordwest	7·41	+ 2·42	·76	5	21	56·0	17	26·2	3	5	18
,,		Aberystwith (Gogerddan) ...	3·69	— 1·19	·65	7	17	56·0	17	...	...	...	...
,,		Llandudno... ...	3·77	+ ·81	·80	7	18	60·0	27	30·0	22	2	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	11·24	+ 7·22	1·80	26	20	56·0	17	20·0	23	12	...
XIII.		Edinburgh (Blacket Place)...	2·45	...	·39	28*a*	15	54·0	27	24·9	23	10	18
XIV.		Colmonell	6·97	...	·75	26	20	54·0	27	25·0	2	...	...
XV.		Lochgilphead (Kilmory)...	...	...	...	...	...	...	...	...	...	...	...
,,		Mull (Quinish)...	6·35	— 1·22	·81	6	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	6·00	+ 2·69	·90	9	15	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·35	+ 1·27	·50	5	19	52·6	17	21·9	23	12	...
XVII.		Braemar	4·99	+ 2·52	·81	8	17	50·0	27	16·0	23	18	21
,,		Aberdeen (Cranford)	3·68	...	·90	10	23	51·0	26	20·0	22*f*	18	...
,,		Cawdor (Budgate) ...	3·04	+ ·58	·50	8	23	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	8·91	+ 3·14	1·50	27	13	...	...	...	...	...	...
,,		Glencarron Lodge...	9·65	...	1·25	8	22	53·6	26	21·2	22	13	...
XIX.		Dunrobin ...	2·78	— ·59	·81	8	13	51·0	27	23·8	23	10	...
,,		S. Ronaldsay (Roeberry)...	4·40	+ ·74	·60	11	17	49·0	17*c*	32·0	2	1	...
XX.	IRELAND.	Darrynane Abbey...	6·25	...	·63	12	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·48	+ 1·84	·82	12	21	56·0	26	29·0	3	2	...
,,		O'Briensbridge (Ross) ...	5·27	...	·54	25	19	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	3·47	+ ·35	·53	7	23	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·84	— ·32	·26	5	18	57·8	27	32·9	3	0	12
XXII.		Ballinasloe	4·59	+ 1·17	·90	26	21	50·0	16	28·0	31	5	...
,,		Clifden (Kylemore)	11·91	...	1·58	29	24	...	...	...	...	...	...
XXIII		Waringstown ...	4·57	+ 1·53	1·07	26	17	55·0	16*d*	28·0	2*g*	8	11
,,		Londonderry (Creggan Res.).	4·62	+ ·41	·62	26	21	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	4·65	+ ·97	·93	26	20	52·0	7*e*	29·0	22	10	16

+ Shows that the fall was above the average ; — that it was below it.

a—and 29. *b*—and 17. *c*—and 26. *d*—and 26, 27. *e*—and 16, 25. *f*—and 23. *g*—and 22.

METEOROLOGICAL NOTES ON DECEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—A wet month at last, but not enough R to fill up ponds and springs. The second week very wet, and the last five days showery. Much wind at times. Hard frost from 22nd to 26th. Duration of sunshine 67 hours. Dense fog nearly all day on 18th. Gales from S.W. on 7th, N.W. on 11th, and S on 29th and 30th. On 1st, 6 hrs. 40 min. of sunshine, and on 25th, 6 hours.

ADDINGTON.—Max. temp. rather high at times; from the 13th to the 17th it averaged 54°, and from the 24th to the end, 50°. Sharp frost on the 4th, and again from 23rd to 26th. On the 18th thick fog all day. Wind high on several days. Floods on the 15th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A mild and windy month, with no snow.

NORWICH, BRUNDALL.—A mild and stormy month, with some sharp rime frosts at Christmas. At the close of the month violets, chrysanthemums and Christmas roses were in full bloom in the garden, with winter aconites and snowdrops coming through the soil, and nearly ready to bloom. H, sleet, and a few flakes of S on 2nd. Gales on 7th, 29th, and 30th.

TORQUAY, CARY GREEN.—Rainfall 3·69 in. above the average. Mean temp. 46°·0, or 3°·1 above the average. Duration of sunshine 79 hrs. 10 min., being 27 hrs. 5 min. above average; 10 sunless days.

POLAPIT TAMAR.—Very wet and stormy, and unseasonably warm. H on 1st, 8th, 9th, and 28th. L and T at 4.30 p.m. on 14th. Gales from S. on 7th and 10th, W.S.W. on 8th and 13th, S.S.W. on 16th, 26th, and 29th.

STROUD, UPFIELD.—S.W. gales on 7th, 13th, 16th, 28th and 29th. L and T on 14th.

WOOLSTASTON.—Stormy weather prevailed in the early part of the month, with heavy gales on 7th and 8th, and again on 26th and 29th. There was a good deal of sharp frost, but the middle of the month was mild and genial. Mean temp. 39°·4.

ROTHERBY HALL.—Rainfall ·65 in. above the average, and the month was dull and damp, with much wind. On the 4th more than half an inch of S fell. On the 23rd the temp. on grass fell to 12°.

HULL, PEARSON PARK.—H on 2nd. Fog on 5th, 12th, 13th, 14th, 18th, 19th, 22nd, 23rd, and 24th. Stormy on 28th, 29th and 30th.

WALES.

HAVERFORDWEST.—December was wet and stormy up to the 16th, with temp. above the mean, and vegetation in a luxuriant condition; a mild frost then set in, with much mist and fog, and grass temp. rather low (18°·6 on 23rd), this weather lasted until the 25th. Another stormy wet period followed, which lasted to the end of the month. The wettest December since 1891, when 7·87 in. fell.

ABERYSTWITH, GOGERDDAN.—Strong gales from 27th to 30th.

LLANDUDNO.—T and L on 30th. Lunar halo on 12th. Rainbows seen on six days, that on 27th lasting for four hours.

SCOTLAND.

CARGEN [DUMFRIES].—A month of wet, unsettled weather, the rainfall (11·24 in.) being the heaviest in any month since observations commenced in 1860, the nearest approach to it being 10·72 in. in October, 1874; 6·50 in. fell in the last six days, quite the heaviest fall ever experienced here. The fall of 1·80 in. on 26th has been exceeded on only 5 days during 38 years. The mean temp. is 1° above the average for December, and on only 11 days did the minimum fall below 32°. On 26th it blew hard from S.E., and easterly winds prevailed on 14 days. T and L occurred on 4 days, and a severe TS, during which the L was very vivid, on the evening of the 30th; slight S fell on 8th. Sunshine was conspicuous by its absence, and during 18 days the sun was never seen.

EDINBURGH, BLACKET PLACE.—S on 1st and 8th. Dense fog on 18th, 22nd, 23rd, and 24th.

COLMONELL.—Rain 1·90 in. above, and mean temp. 4°·1 above, the average of 21 years.

MULL, QUINISH.—With the exception of a week of fine weather, with some frost from 18th to 24th, the month was mild, wet and stormy. A gale of unusual violence blew from S.S.W. on the 30th.

BRAEMAR.—A wet, but open month.

ABERDEEN, CRANFORD.—Very mild and warm, the mean temp. on some nights being between 40° and 45°.

S. RONALDSAY, ROEBERRY.—Not a bad month upon the whole, although the rainfall is ·93in. above the average of 30 years. Mean temp. 40°·7, or 1° above the average.

IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; the middle part very wild and stormy. N.W. gale with H showers on 8th. Strong S.W. gale, and very heavy sea on 15th.

WATERFORD, BROOK LODGE.—H and sleet on 8th. H on 13th, 27th, and 30th. The Comeragh mountains well covered with S on 9th. Mean temp. 44°·8.

O'BRIENSBRIDGE, ROSS.—A very dreary and wet month, excepting one week from 16th to 24th, Frequent and severe gales, mostly from S.E.

DUBLIN, FITZWILLIAM SQUARE.—A changeable open month, with frequent, but not heavy rain, and almost entire absence of frost. Mean temp. 44°·9, or 3°·6 above the average. A lunar halo was seen on the 9th. High winds were noted on 15 days, and attained the force of a gale on 7 occasions. Foggy on 7 days. S and sleet on the 8th; H on the 14th. Aurora borealis on the 11th. L on the evening of the 14th.

KYLEMORE HOUSE.—Gales on 3rd, 8th, 13th, 26th, 27th, and 29th. Weather very wild on 14th, 15th, and 28th.

OMAGH, EDENFEL.—Another mild month, with considerable rainfall, but no snow or frost of any severity. Christmas day was especially soft and springlike with a mean temp. of 46°·5

END OF VOL. XXXII.

SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE

VOLUME THE THIRTY-THIRD.

1898.

LONDON:
EDWARD STANFORD, COCKSPUR STREET, S.W.
1899.

THE NEW YORK
PUBLIC LIBRARY
200854
ASTOR, LENOX AND
TILDEN FOUNDATIONS.
R 1900.

INDEX.

PAGE

Aëronautical Conference at Strasburg, The International 81
Africa, South, Floods and Storms in 41, 85
Algeria, The Climate of 49
American Association, The 120
Anticyclones and Frost 179
Assam, The Great Earthquake of, June 12th, 1897 166
August, Thunderstorms of July and 120
Aurora 42, 136, 182
Aurora of September 9th, 1898..... 136
Australasian Society for the Advancement of Science, The... 26, 40
Australasian Weather Guide, Wragge's 87, 151
Balloon Ascents, Scientific..... 84
Barometer, High, Warmth, Dryness and, in January, 1898..... 5
Belgium, Meteorology in 135
Book of Knowledge 179
Black Rain..... 40
Bristol, The British Association at 145, 164
British Association at Bristol... 145, 164
British Local Meteor. Publications 97, 113
British Rainfall..... 170
Buys-Ballot 26
Camden Square, Meteorological Observations at, for the 40 years 1858-97 .....1, 21, 37, 52, 68, 91, 106, 123, 139, 155, 171, 183
Climate of Algeria, The 49
,, ,, Edinburgh 7
,, ,, Paris, The 33
Climatological Tables for the British Empire 12, 28, 44, 60, 76, 92, 108, 124, 140, 156, 172, 184
Climatology, Geology and Hydrology. Fifth International Congress 89
Clouds, Altitude of 181
Colours of Flowers and Drought ... 169
Cycle of 19 years and the Summers of 1860 and 1879 .....57, 73
Drought and Heat in Sept., 1898 ... 129
Drought and the Colours of Flowers 169
Drought in July 116
Drought, The, of 1898 153
Dryness, Warmth and High Barometer in January, 1898 5

PAGE

Dry Winter of 1897-98, The... 39, 53, 66
Earthquake of June 12th, 1897, The Great Assam 166
Earth Temperature 24
Edinburgh, Climate of 7
Errata in Meteor. Magazine, 1897... 112
Evaporation and Temperature 116
February 21st, West of England Snow Storm 17
FitzRoy, Admiral..... 161
Floods and Storms in South Africa 41, 85
Flowers, the Colours of, and Drought 169
Geology, Hydrology and Climatology, Fifth International Congress on 89
Gloomy Summers of 1860 and 1879 and the 19 years' Cycle, The...57, 73
Godfridus—The Book of Knowledge 179
Heat and Drought in Sept., 1898... 129
Heavy Rains, Oct. 15th-18th, 1898 154
High Barometer, Warmth, Dryness and, in January, 1898..... 5
Hydrology, Climatology and Geology, Fifth International Congress on 89
International Aëronautical Conference at Strasburg, The 81
International Congress on Hydrology, Climatology and Geology, The Fifth 89
January, 1898, Warmth, Dryness and High Barometer in 5
July, 1898, Drought in 116
July and August, Thunderstorms of 120
July 26th and 27th, 1897, Heavy Rainfall at Jewell, Maryland, U.S.A. 72
June 12th, 1897, The Great Assam Earthquake of 166
Lightning Conductors..... 65
Lightning on an Oak Tree, The effect of 136, 154
Local Meteorological Publications, British 97, 113
Lunar Rainbow..... 152
Maryland, U.S.A., Heavy Rainfall at Jewell, July, 1897 72
Mauritius, Publications of the Royal Alfred Observatory 89, 168

PAGE

Meteorological Notes on the Months 15, 31, 47, 63, 79, 95, 111, 127, 143, 159, 175, 187
Meteorological Observations at Camden Square, London, for the 40 years, 1858-97 1, 21, 37, 52, 68, 91, 106, 123, 139, 155, 171, 183
Meteorological Publications, British Local 97, 113
Meteorological Society, The Royal 10, 22, 43, 59, 67, 107, 169, 177
Meteorology in Belgium 135
Meteorology, The Genesis of, and Admiral FitzRoy 161
Nicaragua, Rainfall in 170
Oak Tree, The effect of Lightning on an 136, 154
October 15th–18th, 1898, Heavy Rains 154
Paris, The Climate of 33
Publications of the Royal Alfred Observatory, Mauritius 89, 168
Rain, Black 40
Rainbow, Lunar 152
Rainfall in Nicaragua 170
Rainfall, The Heavy, at Jewell, Maryland, U.S.A., July 26th and 27th, 1897 72
Rainfall, Summer 69
Rainfall and Temperature, Monthly 14, 30, 46, 62, 78, 94, 110, 126, 142, 158, 174, 186
Rains, Heavy, Oct. 15th–18th, 1898 154
Rockall 119
Reviews :—
The Meteorology of Edinburgh. Parts I. and II. By R. C. Mossman, F.R.S.E. 7
Ueber Moorausbrüche, von Jakob Früh 9
Neudrucke von Schriften und Karten . . . von Prof. Dr. Hellmann. No. 10, Rara Magnetica, 1269–1599. No. 11, Winkler, Franklin, Dalibard, Le Monnier. Ueber Luftelektricität, 1746–1753 10
Der Tägliche Wärmeumsatz im Boden, und die Wärmestrahlung zwischen Himmel und Erde von Dr. Theodore Homén 24
Observational Astronomy: a practical book for amateurs. By Arthur Mee, F.R.A.S. 38
Beiträge zur Geophysik. Zeitschrift für physikalische Erdkunde. Heraus-gegeben von Prof. Dr. Georg Gerland. Band III. Heft 1 and 2 38

PAGE

Ueber das Wetterschiessen am südöstlichen Abhange des Bachergebebirges nächst Windisch-Feistritz (Steiermark) von Albert Stiger 58
Blue Hill Meteorological Observatory. A. Lawrence Rotch, Director. Exploration of the Air by means of Kites 58
Weather Lore : Proverbs, Sayings and Rules concerning the Weather, compiled by Richard Inwards, F.R.A.S. 75
Science Progress. New Series, Vol. II., No. 8. Miers "On Meteorites" 87
Wragge's Australasian Weather Guide and Almanac for 1898 87, 151
Earthquakes and other Earth Movements, by J. Milne, F.R.S., F.G.S. 88
Congrès National d' Hygiène et de Climatologie Médicale de la Belgique et du Congo 167
Etudes internationales des Nuages 1896–7 181

Science, Australasian Society for the advancement of 26, 40
Scientific Balloon Ascents 84
September 9th, 1898, The Aurora of 136
Sept., 1898, Heat and Drought in... 129
Snow Storm, February 21st, West of England 17
Storms and Aurora 182
Strasburg, The Aëronautical Conference at 81
Storms and Floods in South Africa 41, 85
Summer Rainfall 69
Summers of 1860 and 1879 and the 19 years' Cycle 57, 73
Supplementary Tables of Rainfall 13, 29, 45, 61, 77, 93, 109, 125, 141, 157, 173, 185
Temperature and Evaporation 116
,, Underground ... 24
Thunderstorms of July and August 120
Warmth, Dryness and High Barometer in January, 1898 5
Weather Guide, Wragge's Australasian 87, 151
Weather Proverbs 75, 181
Well Record, A long if not unique 70
West of England Snow Storm, February 21st 17
West India Hurricane 177
Winter, The Dry, of 1897-98 39, 53, 66

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW PUBLIC LIBR
ASTOR, LENOX AN
TILDEN FOUNDATIO

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCLXXXV.] FEBRUARY, 1898. [PRICE FOURPENCE, *or 5s. per ann. post free.*

METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE, LONDON, N.W.

Lat. 51° 32′ 40″ N.; Lon. 0° 8′ 0″ W. Altitude 111 ft.

I WOULD always rather refer to the work of someone else than to my own, but there are few records of meteorological observations day and night for forty years without a break, absolutely uniform in system, nearly so as to instruments and locality, and mostly made by one person. Moreover, rightly or wrongly, special interest attaches to the climate of the million-peopled metropolis, and there is no station with suitable exposure in or near London which has been at work nearly so long as that at Camden Square.

For these reasons I have had the records worked up, and intend to give during the present year a series of tables for each month similar to that for January on p. 4.

In this long period there have, of course, been more than 14,000 days, giving considerably more than 500,000 entries, and to compress the results of one-twelfth of these into a single-page table has not been easy; hence considerable care must be used in quoting from the table, and the following explanations, which will apply to all the series, should be read carefully.

EXPLANATIONS.

Each table refers to the 40 months of that *name*, and is entirely independent of any other month or months.

The values refer to the 40 years beginning with January 1st, 1858, *except as under:—*

Grass minimum (38 years)	begun Jan. 1st, 1860
Solar Radiation, Black Bulb (28 years)...	,, ,, ,, 1870
Temp. of Soil at 1 foot (27 years) ...	,, ,, ,, 1871
Solar Radiation, Bright Bulb (20 years)	,, ,, ,, 1878

The barometer has always been within a few feet of 110 ft. above

mean sea level (111 ft. from 1868–97), but all readings have been corrected for index error and temperature and reduced to sea level.

The shade thermometers have always been on a Glaisher pattern (*Met. Mag.*, Vol. III., p. 155) thermometer stand, duly turned so as to keep the thermometers in perfect shade.

The solar radiation thermometers have been on a post 4 ft. above ground.

The rain gauge quoted has always been an 8-inch one, with its rim 1 foot (or a little less) above the ground.

As regards rainfall, it will be understood that though the word at the top of column is "means," the values in columns 1, 2, 3, 5, 6, 8 are totals.

Col. 1 gives the mean of all the readings in the whole period; twice a day as regards barometer, shade temp., cloud and rainfall, the other elements once a day. For instance, 29·982, 38·1 and 7·0 are the means of the corresponding two entries in Col. 5, and 2·02 is the sum of the two entries in that column.

Col. 2 gives the highest mean for any one of the 40 Januaries and the year in which it occurred. This must not be confused with the absolute highest, which will be found in Cols. 10 and 11.

Col. 3 gives the lowest mean for any one of the 40 Januaries and the year in which it occurred.

Col. 4 gives the hours of observation.

Col. 5 gives the mean at each hour of observation for the 40 years. As regards rainfall, the rainfall values show the mean of the total amount measured at 9 a.m. having fallen during the 12 previous (night) hours; and the total measured at 9 p.m. having fallen during the 12 previous (day) hours.

Col. 6 gives the highest mean at each hour of observation.

Col. 7 gives the date of ditto.

Col. 8 gives the lowest mean at each hour of observation.

Col. 9 gives the date of ditto.

Beyond the double rule the table deals with extremes.

Col. 10 gives the actual highest reading for each element at each hour of observation.

Col. 11 gives the date of ditto. The name of the month is not given, because, as already explained, each table deals with only the month named at the top; therefore, in Col. 11 the second entry, which does not look clear, states that the 30·934 mentioned in Col. 10 occurred on the 17th and 18th of January, 1882, and on the 9th of January, 1896.

Col. 12 gives the actual lowest reading for each element at each hour of observation.

Col. 13 gives the date of ditto.

Col. 14 gives the mean of the highest readings in each of the 40 months.

Col. 15 gives the mean of the lowest readings in each of the 40 months.

Remarks.

I do not intend to offer any comments upon the tables; the facts are there, and I leave them for the consideration of my readers. But there is one item, to which attention is often given, which does not appear in the table, and it may be well to explain why it is not given. It is mean temperature, and I do not give it because meteorologists are not in complete accord as to how it is to be determined; and probably the method depends somewhat on the pattern of thermometer stand adopted. I do not intend to refer to this subject again, so shall consider it fully now, using the January values to show the different results obtainable according to the method adopted.

Mean temperature is often taken (where a Stevenson pattern thermometer screen is used) as the mean of the mean maximum and of the mean minimum; if so, we should have :—

$$\frac{43{\cdot}0 + 33{\cdot}3}{2} = 38°{\cdot}15$$

Sometimes the mean of the 9 a.m. and 9 p.m. dry is incorporated with it; then we should have :—

$$\frac{43{\cdot}0 + 33{\cdot}3 + 37{\cdot}7 + 38{\cdot}4}{4} = 38{\cdot}10$$

But, as already stated, the thermometer readings used in these tables are from thermometers mounted on a Glaisher pattern stand, and then, perhaps, the corrections given in Mr. Glaisher's *Diurnal Range Tables* (4th ed., Taylor & Francis, 1867) should be used, and they would give :—

			Correction.		True mean.	
Max. 43·0 Min. 33·3	Mean	38·15	−0·2	...	37·95	= 38°·43
9 a.m. 37·7	...		+1·2	...	38·9	
9 p.m. 38·4	...		+0·5	...	38·9	

However, their applicability and other subjects must be considered when the tables are all published.

JANUARY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
						Highest Month.		Lowest Month.		Highest.		Lowest.		Mean of all Highest	Mean of all Lowest.
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·982	30·378	29·573	9 a.m.	29·983	30·378	1880	29·583	1865	30·950	18th, 1882	28·528	20th, 1873	30·533	29·163
		1880	1865	9 p.m.	29·981	30·378	1880	29·564	1865	30·934	17, 18 '82; 9, '96	28·476	20th, 1873	30·525	29·246
Shade Temp. Dry Bulb	38·1	43·8	31·2	9 a.m.	37·7	43·4	1875	30·2	1881	53·9	1st, 1883	7·2	4th, 1867	50·2	25·0
		1884	1881	9 p.m.	38·4	44·3	1884	31·8	1879	54·6	1st, 1883	12·8	4th, 1867	50·3	27·4
Shade Temp. Max.	43·0	..	...	...	...	48·9	1890	35·8	1879	56·4	19th, 1877	16·9	4th, 1867	53·1	31·7
Shade Temp. Min.	33·3	...	...	...	...	39·2	'75, '84	26·1	1881	52·3	1st, 1860	6·7	4th, 1867	45·8	21·8
Shade Temp. Wet Bulb	36·9	42·8	30·6	9 a.m.	36·6	42·4	1875	29·6	1881	53·0	1st, 1883	7·2	4th, 1867	48·8	24·6
		1875	1881	9 p.m.	37·3	43·1	1875	30·9	1879	52·8	9th, 1862	12·8	4th, 1867	49·3	26·6
Solar Rad., black	53·7	...	...	...	...	61·8	1877	44·1	1879	87·3	30th, 1877	26·5	2, '71; 1, '87	75·5	34·7
Solar Rad., bright	43·9	...	...	...	...	52·1	1890	35·4	1881	60·3	29th, 1884	22·5	15th, 1881	55·5	31·6
Grass Minimum	30·1	...	...	...	...	36·4	1875	21·9	1881	50·9	1st, 1860	0·5	5th, 1867	43·3	17·0
Soil, 1 foot	38·3	...	...	...	...	42·8	1873	33·8	1891	47·6	2nd, 1883	32·0	29th, 31st, '80	42·4	35·1
Cloud	7·0	8·4	4·8	9 a.m.	7·1	8 9	1885	5·7	1860	10	Every year	0	Various	10·0	0·6
		1871	1858	9 p.m.	6·8	8·6	'68, '71	3·7	1858	10	Every year	0	Various	10·0	0·2
Rainfall	2·02	4·74	·31	9 a.m.	1·12	2·59	1865	·01	1880	1·20	11th, 1866	·00	Every year	·33	·00
		1877	1880	9 p.m.	·90	2·81	1879	·09	1864	·85	18th, 1881	·00	Every year	·31	·00

Max. Rainfall in 24 hours, 1·20 in., 10th, 1866. Mean max. daily fall, ·47 in.

WARMTH, DRYNESS AND HIGH BAROMETER IN JAN., 1898.

WE have been favoured with so many notes upon the above subjects, that we have to insert only a selection—preferably those with long averages.

Camden Square, London.—Compared with the table on page 4, the features of 1898 are: barometer almost unprecedentedly high; mean temperature by dry bulb 0°·05 above 1884, and therefore the highest on record; min. in air and min. on grass 0°·6 and 0°·5 respectively above the highest previous records, which were in 1875 and in 1884; rain only about a third of the average, but more than twice that of 1880.

To the Editor of the Meteorological Magazine.

SIR,—I enclose you a bean in blossom, one of many self-sown, in a field about 470 feet above the sea-level near my house. I have never before seen anything so early. It is a thermometric reading of Nature's, worthy perhaps of note.—Yours truly,

W. C. PLENDERLEATH.

Mamhead Rectory, Exeter, Jan. 24th, 1898.

SIR,—We must go back a great many years to find such a minimum as we recorded last week, viz., 51°; in 1852, on December 27th, we recoded 52°, and in 1851, on January 2nd, 51°. This time last year our roads were all blocked with snow, and they were literally quarrying it out.—Yours very truly,

W. LUCAS.

The Firs, Hitchen, Jan. 24th, 1898.

SIR,—January has here been remarkable as regards both dryness and warmth; an unusual coincidence. Less rain has fallen in Herefordshire than in any previous January as far back as 1818. The following are the instances in which less than an inch has fallen during 81 years. (*My own register covers the* 40 *years*, 1859–98.)

	in.		in.		in.
1822	·72	1848	·54	1888	·69
1824	·45	1855	·29	1889	·84
1825	·94	1858	·44	1896	·37
1829	·74	1861	·75	1898	·28
1833	·67	1880	·66		

It will be seen that 1855 closely approximates to 1898, but the temperature was some eight degrees lower in the former year. In other years, too, such as 1829, 1861 and 1880, the month of January was very severe. Almost the whole of the rain in the past month fell in one day, viz., the 4th; the rest being a mere sprinkle.

Taking the month of January by itself, that of 1884 is a shade

warmer than 1898; but the following comparison shows that for the 38 days ending Feb. 1st, 1898 has the highest mean temperature:—

	Max.	Min.	Combined.	Rainfall.
	°	°	°	in.
Dec. 26, 1897, to Feb. 1, 1898 ...	48·7	39·4	44·0	1·55
,, ,, 1883, ,, ,, ,, 1884 ...	48·1	39·7	43·9	3·58
,, ,, 1876, ,, ,, ,, 1877 ...	49·6	37·5	43·6	7·20

For the three months of November, December and January:—

	Max.	Min.	Combined.	
	°	°	°	
1876–7 ...	49·4	38·1	43·8	7 warmest winters, 1859–1898.
1897–8 ...	48·4	38·5	43·5	
1881–2 ...	48·2	38·2	43·2	
1883–4 ...	48·0	37·8	42·9	
1877–8 ...	48·5	37·2	42·9	
1868–9 ...	48·4	37·3	42·9	
1889–90 ...	48·1	36·6	42·4	

By way of contrast:—

1878–9 ...	39·3	28·3	33·8

Vegetation is more forward than I remember it at the same time, notwithstanding that the sky was covered with clouds, mean 8·0. The barometer was nearly as high as in 1880 and in 1882.—Yours, &c.,

H. SOUTHALL.

The Graig, Ross, Herefordshire, Feb. 2nd, 1898.

SIR,—In case you should deal with the high temperature of January, 1898, I send you the following, viz.:—

Mean of Max. and Min.

	Old Stand.	Stevenson Screen.
	°	°
1898	42·9	43·0

And for comparison:—

1890	40·9		
1884	42·0		
1882	39·7		
Maximum temp.	on	30th Jan.	55·0
Minimum ,, ...	,,	17th ,, ...	28·7
Highest Minimum temp..	,,	20th ,, ...	50·0

Only two days with frost in the screen at 4 ft.

This January was most like 1882, being fine in the middle of the month, with high barometer, and wet at the beginning and end; but 1882 was decidedly colder. All thermometers are verified.

I am, yours truly,

CHARLES L. BROOK.

Harewood Lodge, Meltham, Huddersfield, Feb. 4th, 1898.

P.S.—Snowdrops out on Jan. 20th, the earliest by far since and including 1885.

SIR,—The following may interest your readers :—

1890, Jan. 5th..... ..... Max. recorded Temp..... 63°

Means.

Max.... 49°·0 Min.... 37° 2 Mean of Means ... 43°·1

1898, Jan. 20th and 30th..... Max. Temp. ..... 56°

Means.

Max.... 48°·1 Min.... 34°·3 Mean of Means ... 41°·2

3 nights over 50°
14 ,, ,, 40°
9 ,, under 32° or upon it.

Averages for previous ten years.

Max... 42°·8 Min.... 31°·7 Mean of Means ... 37°·2

I found geraniums in blossom out of doors in the Conway Valley last month, also hydrangea 600 ft. above sea.

Yours faithfully,

R. J. ROBERTS.

Pool Quay Vicarage, Welshpool, Feb. 2nd, 1898.

REVIEWS.

The Meteorology of Edinburgh. Parts I. and II., by R. C. MOSSMAN, F.R.S.E., F.R.Met.Soc. [Excerpts *Trans. Roy. Soc. Edin.*] 4to, 1896 and 1897, 224 pages and 7 plates.

IF asked to name the man who in the British Isles is working the hardest at meteorology, we think that we should name Mr. Mossman. It does not seem to matter whether it be taking duty on Ben Nevis, working up the non-instrumental meteorology of London, or—as in the work before us—dealing with the climate of his own beautiful city, Mr. Mossman is always ready ; and what he does, he does well, regardless of the work it may entail. We may illustrate this, which we know to be a fact, by quoting the first line which we read in his paper, after we had written the preceding words :—"The tables which accompany the text have been derived by immense condensation from over one million observations, the re-tabulation of which was required as a necessary preliminary."

What a pæan of triumph would have announced the completion of such a work by the combined strength of a Government department ! —but Mr. Mossman is only an amateur.

It is quite impossible to give in a notice like this a complete account of these memoirs. We cut from a Glasgow newspaper the opening paragraph of its notice of Mr. Mossman's work, and it puts the matter so clearly that we reprint it, instead of saying anything ourselves on that part of the subject :—

EDINBURGH WEATHER.

Edinburgh deserves credit for having presented to the world so full and accurate an account of her weather as that which is given in the elaborate statistics and charts just published from the Transactions of the Royal Society

of Edinburgh. Mr. Mossman, the compiler of the statistics, has spared no pains to make his record perfect. Every possible source of information from 1731, when there is the first known record of weather at Edinburgh, down to the present year, has been carefully examined; and as from 1764 onwards there are almost continuous records of weather from more than one observer, we may take it that the essential facts are known continuously for the long period of 132 years.—*North British Daily Mail, Nov. 16th*, 1896.

Having expressed, but certainly not too strongly, our great admiration of the work as a whole, we may as well mention points in which we should not have done as Mr. Mossman has. (It does not follow that Mr. M. was wrong.)

We do not believe in $\frac{1}{100}$ths of a degree Fahrenheit, and in all the temperature tables in Part I. we should have given one place of decimals, not two, and this we see that the author has done in Part II.

Table XVII., Daily Rainfall.—We should have divided the entries by the number of years, so as to give the mean daily fall, instead of the total in the 88 years.

These are the only criticisms which we have to make; their triviality is perhaps the strongest praise that we could give.

We do not see that Mr. Mossman has anywhere thrown together the principal results which he has obtained, we therefore have tried to do so:--

Data respecting the Climate of Edinburgh.

Column ...	1	2	3	4	5	6	7	8	9	10	11	12
	Mean Pressure at Sea Level	Temperature.					Humidity.	Rain.				
		Mean	Highest.		Lowest.		Mean.	Mean	Greatest.		Least.	
	in.	°	°	Date.	°	Date.	per cent	in.	in.	Date	in.	Date.
Jan.	29·818	36·8	59·0	30 '46	5·0	31 '45 29 '48	87	1·95	5·62	1867	·14	1787
Feb.	·813	38·3	64·0	28 '46	11·9	8 '95	86	1·70	6·38	1894	·13	1891
Mar.	·864	40·3	68·0	31 '44	15·0	2 '81	84	1·53	4·84	1827	·03	1781
April	·895	44·8	76·0	28 '40	23·0	17 '49	81	1·49	4·55	1871	·15	1842
May	·940	49·9	79·2	31 '81	26·0	9 '50	78	1·90	4·77	1847	·15	1844
June	·932	55·7	85·9	18 '93	32·0	4 '51	77	2·17	6·90	1853	·20	1801 1806
July	·876	58·6	86·7	16 '76	38·0	16 '45 2 '48 4 '51	79	2·81	6·57	1830	·15	1825
Aug.	·875	57·8	87·7	5 '68	35·0	30 '69	82	2·80	8·33	1877	·40	1880
Sept.	·874	53·6	81·7	6 '68	31·0	22 '44 23 '45 27 '47	83	2·40	10·69	1785	·22	1810
Oct.	·810	47·2	71·0	14 '45	24·3	20 '80	86	2·52	6·90	1864	·16	1830
Nov.	·801	40·9	62·0	17 '44	19·8	18 '85	87	2·38	6·78	1770	·38	1805
Dec.	·800	38·3	62·0	25 '43	6·4	15 '82	86	2·21	8·42	1787	·34	1843
Year	29·858	46·8	87·7	...	5·0	...	83·0	25·86	38·96	1872	15·27	1826

In the foregoing table the values in the several columns are based upon the following number of years :—

Col. 1	... 127 years, 1770–1896	Col. 7	... 35 years, 1862–1896
,, 2	... 133 ,, 1764–1896	,, 8 to 12	120 ,, 1770–1896
,, 3 to 6	57 ,, 1840-1896		

The entries in columns 4 and 6 being rather abbreviated, it may be well to explain that the first is the day of the month on which the extreme occurred, and the latter the year, the figures 18 being omitted; therefore, the first entry shows that the highest temperature recorded in Edinburgh in January between 1840 and 1896 was 59°·0, on January 30th, 1846.

Of course, there are endless interesting details which we have not given; for instance, the extremes of barometric pressure at sea level —highest, 31·071 inches on January 9th, 1896; and lowest, 27·451 inches on January 26th, 1884. Maximum rainfall in one day, 4·20 inches, on December 9th, 1787. Then Mr. Mossman gives the mean values of pressure, temperature, &c., for each day of the year, the comparison of which with similar data for other stations offers a tempting field for study; so do the long sets of annual means, which afford excellent material for those devoted to cycles—not the two-wheeled ones, but those of x years—in more senses than one.

Ueber Moorausbrüche, von JAKOB FRÜH. [Excerpt *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich.* Zurich, 1897, 8vo, 34 pages.

OUR readers will remember that about five square miles of bog in Killarney slipped away in December, 1896, considerable damage being caused, and several lives lost. The paper before us is not merely an epitome of the facts, but it quotes 30 other instances of a somewhat similar nature in the previous 350 years, giving, as far as practicable, localities, dates and authorities.

Herr Früh concludes his paper by stating his views as to the cause of these occurrences, and illustrating them by reference to the thirty instances of which he has given details. He discusses the subject thoroughly, and his paper is well worth reading; but it seems to us that a little further consideration as to the *daily* rainfall, rather than its total amount, and to season of the year as affecting the proportion evaporating and that penetrating, would have been desirable; and we feel nearly sure that a watchful man would always know *when* a bog was likely to "slide," and that very little engineering knowledge or expenditure would be required to prevent such an occurrence. Whether the risk is sufficiently great to justify any regular expenditure for this object is, we think, extremely doubtful, seeing that all over the world there seems to be only about one instance in six years.

Neudrucke von Schriften und Karten . . . . . von PROF. DR. HELLMANN. No. 10, Rara Magnetica, 1269–1599. No. 11, Winkler, Franklin, Dalibard, LeMonnier. Ueber Luftelektricität 1746–1753. 4to Asher & Co., Berlin, 1898.

DR. HELLMANN is going steadily on with his splendid series of reprints, and is by their publication conferring a lasting benefit upon all who care anything about the early history of Meteorology and Terrestrial Magnetism. The "Introduction" and "Remarks" to the above parts are of the same high class as in all the previous ones, and those persons who possess the complete set have facsimiles so good that we would rather have them (*with* Dr. Hellmann's notes) than the originals, practically unattainable as they nearly all are. Some idea of the scarcity may be gathered from the fact that, as Dr. Hellmann points out, the title of No. 10 might very well have been "Rara Magnetica ante Gilbertiana."

No. 11 is the more interesting to Meteorologists, and indeed it is intensely so. There is Winkler's paper (1746) on how far the sparks from electrical apparatus are to be considered analogous to lightning and thunder; this is followed by Franklin's note (1749), "Opinions and Conjectures concerning the Properties and Effects of the Electrical Matter," the account of his kite, lightning conductors, &c. —Next we expected to find Barberet's Dijon Prize Essay (1750), but Dr. Hellmann evidently considers the reference to it on page 6 sufficient, for he passes on to (1752) Dalibard's experiments at Marly-la-Ville, near Paris, and Le Monnier's (1752) *Observations sur l'Electricité de l'Air.*

ROYAL METEOROLOGICAL SOCIETY.

AN Ordinary Meeting of this Society was held on Wednesday the 19th January at the Institution of Civil Engineers. Mr. E. Mawley, F.R.H.S., President in the chair, at which the following Fellows were elected.

Samuel Barker, F.R.A.S., 9, Hanover Terrace, Regent's Park, N.W.
Robert Thomas Ford, Sunbeam, Windermere.
Leon Franklin, 19, Gower Street, W.C.
George Goût, Mem. San Inst. Beilby House, Cleethorpes.
Tom G. Longstaff, B.A. Christchurch College, Oxford.
Mrs. E. Rylands, Longford Hall, Stretford, Manchester.

At the Annual Meeting (which immediately followed) the Secretary read the Report of the Council for the year 1897, showing that there had been an increase in the number of Fellows and that the finances were satisfactory, the total income having been £1465, and the expenditure £1180.

The President, Mr. Edward Mawley, then gave an address on "Weather influences on farm and garden crops" in which he pointed out the intimate connection between Meteorology, Agriculture and

Horticulture. He explained the special characteristics of the Climate of the British Isles as regards temperature, rainfall, &c. Of all the influences brought to bear on vegetable life by the atmosphere, he considered temperature to be the most powerful and far reaching, and only second to this came rainfall. The leading effects of snow, wind, and sunshine, as well as of prolonged droughts, severe frosts and persistent rains, also were described. He then dealt with the influence of different important weather changes on such farm crops as wheat, roots, grass, &c., as well as on fruit trees, vegetables, and flowering plants in the garden. In his concluding remarks he called attention to the great want of experimental farms in conjunction with meteorological stations being established in this and other countries in Europe. For it was only by the examination of meteorological observations, together with weekly records of the extent and character of the growth made by our leading crops, that the close connection existing between weather changes and their influences on such crops could be clearly traced.

The President was accorded a hearty vote of thanks for his address and for his services during the year.

The scrutineers (Major King and Major Lamorock Flower) announced that as the result of the ballot the council for the ensuing year would be :—

President.

F. Campbell Bayard, LL.M.

Vice-Presidents.

G. Chatterton, M.A. M.Inst.C.E.
R. H. Curtis
W. H. Dines, B.A.
H. R. Mill, D.Sc., F.R.S.E., F.R.G.S.

Treasurer.

H. Perigal, F.R.A.S., F.R.M.S.

Secretaries.

E. Mawley, F.R.H.S.
G. J. Symons, F.R.S.

Foreign Secretary.

R. H. Scott, M.A., F.R.S.

Council.

R. Bentley, F.L.S., F.R.G.S.
F. J. Brodie
Capt. A. Carpenter, R.N., D.S.O., F.Z.S.
O. Chadwick, C.M.G., Assoc. M.Inst.C.E.
H. N. Dickson, F.R.S.E.
W. Ellis, F.R.S., F.R.A.S.
W. B. Heberden, C.B.
R. Inwards, F.R.A.S.
Baldwin Latham, M.Inst. C.E., F.G.S.
Vice-Admi. J. P. Maclear, R.N., F.R.G.S
C. Theodore Williams, M.A., M.D. F.R.C.P.
Capt. D. Wilson-Barker, F.R.S.E., F.R.G.S.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	88·4	5	48·1	13	73·6	54·8	54·1	73	130·1	42·4	2·92	16	5·3
Malta	90·2	25	66·2	2*c*	86·3	70·5	67·2	73	157·9	61·6	...	...	1·2
Mauritius	78·0	21*a*	59·0	2	76·4	65·1	60·1	73	124·6	52·1	1·72	20	5·8
Calcutta	89·4	10	74·2	21*a*	86·3	78·0	77·7	89	155·9	73·4	11·74	22	8·9
Bombay	87·4	24	76·1	11	85·3	77·8	76·7	85	137·7	72·8	13·82	28	8·7
Ceylon, Colombo	88·2	...	74·2	10	86·1	78·0	74·1	82	142·0	71·0	9·09	25	7·2
Melbourne	68·1	12	34·0	10	56·0	41·8	42·9	80	116·3	24·0	2·03	15	6·7
Adelaide	66·4	27	37·7	23	60·2	44·9	44·6	76	130·4	28·4	3·45	20	6·0
Sydney	72·0	31	42·3	5	60·7	48·3	45·2	78	119·0	30·2	3·97	17	4·2
Wellington	61·5	31	35·0	13	53·5	42·7	39·6	73	115·0	24·0	4·01	21	5·0
Auckland	63·0	7	42·5	13	58·2	46·3	42·9	71	118·0	38·0	4·61	18	6·3
Jamaica, Kingston	94·0	8	71·0	26	89·5	74·0	71·7	73	...	...	2·13	8	1·9
Trinidad	92·0	3*b*	68·0	6	88·0	71·6	74·3	83	166·0	67·0	7·90	21	...
Grenada	88·2	15	72·0	11	84·0	75·4	71·5	78	157·4	...	8·16	23	3·4
Toronto	82·8	14	44·2	21	74·5	55·2	56·2	76	101·5	41·0	2·26	8	4·0
New Brunswick, Fredericton	83·2	8	42·0	24	73·1	52·2	52·9	64	...	...	3·16	9	5·0
Manitoba, Winnipeg	84·4	12	35·8	30	73·4	49·8	...	...	...	...	1·00	11	4·6
British Columbia, Esquimalt	85·5	3	45·2	1	71·9	51·7	52·8	79	...	...	·29	3	5·1

a—and 22. *b*—and 4, 8. *c*—and 31.

REMARKS.

MALTA.—Adopted mean temp. 77°·0, or 1°·2 below the average. Mean hourly velocity of wind 6·9 miles. Average sea temp. 80°·0. L on 4th, 16th and 20th.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 0°·9 above, and rainfall ·52 in. below, their respective averages. Mean hourly velocity of wind 14·2 miles, or 1·8 above average; extremes, 28·1 on 11th and 17th, and 2·7 on 2nd; prevailing direction E.S.E.
T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·1, or 0°·6 above, of dew point 74°·1, or 1°·1 above, and rainfall 9·09 in., or 5·41 in. above, their respective averages. Mean hourly velocity of wind 11·5 miles; prevailing direction S.W. T88 on 9 days.
H. O. BARNARD.

Adelaide.—Mean temp. 1°·4 below, rainfall 1·11 in. in excess of, the average.
C. TODD, F.R.S.

Wellington.—Generally showery, with pleasant intervals. Prevailing S.E. winds, and at times cold weather. Rainfall 1·19 in. below, and mean temp. 0°·1 above, the average. Slight earthquake on 30th.
R. B. GORE.

Auckland.—The early part was fine and dry, but from the 15th to the close stormy, wet and disagreeable. Rainfall about half-an-inch over the average of 30 years. Mean temp. close to the average.
T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·42 in. below the average of 30 years.
J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·84	XI.	Builth, Abergwesyn Vic.	4·84
II.	Dorking, Abinger Hall .	·77	,,	Rhayader, Nantgwillt ...	3·31
,,	Birchington, Thor	·67	,,	Lake Vyrnwy	6·17
,,	Hailsham	·84	,,	Corwen, Rhug	2·12
,,	Ryde, Thornbrough	·59	,,	Criccieth, Talarvor	5·04
,,	Emsworth, Redlands ...	·72	,,	I. of Man, Douglas	2·90
,,	Alton, Ashdell	·57	XII.	Stoneykirk, Ardwell Ho.	1·58
III.	Oxford, Magdalen Col..	·52	,,	New Galloway, Glenlee	4·81
,,	Banbury, Bloxham	·71	,,	Moniaive, Maxwelton Ho.	3·25
,,	Northampton, Sedgebrook	1·05	,,	Lilliesleaf, Riddell	1·10
,,	Duddington [Stamford].	·88	XIII.	N. Esk Res. [Penicuick]	2·05
,,	Alconbury	·82	XIV.	Glasgow, Queen's Park..	2·42
,,	Wisbech, Bank House...	1·29	XV.	Inverary, Newtown	8·48
IV.	Southend	·50	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	·89	,,	Islay, Gruinart School ...	2·15
,,	Colchester, Lexden	·72	XVI.	Dollar.....	2·81
,,	Rendlesham Hall	·80	,,	Balquhidder, Stronvar...	7·64
,,	Rushall Vicarage	1·29	,,	Ballinluig	1·37
,,	Swaffham	1·26	,,	Dalnaspidal H.R.S.....	5·86
V.	Salisbury, Alderbury ...	·39	XVII.	Keith H.R.S.....	1·72
,,	Bishop's Cannings	·49	,,	Forres H.R.S.	1·65
,,	Blandford, Whatcombe .	·74	XVIII.	Fearn, Lower Pitkerrie..	1·55
,,	Ashburton, Holne Vic...	1·50	,,	N. Uist, Loch Maddy ...	5·42
,,	Okehampton, Oaklands.	1·46	,,	Invergarry.....	11·86
,,	Hartland Abbey	2·05	,,	Aviemore H.R.S.	2·37
,,	Lynton, Glenthorne ...	1·03	,,	Loch Ness, Drumnadrochit	3·07
,,	Probus, Lamellyn	1·04	XIX.	Invershin	2·81
,,	Wellington, The Avenue	·64	,,	Durness	6·67
,,	North Cadbury Rectory	1·23	,,	Watten H.R.S.....	1·43
VI.	Clifton, Pembroke Road	1·03	XX.	Dunmanway, Coolkelure	7·56
,,	Ross, The Graig	·28	,,	Cork, Wellesley Terrace	2·27
,,	Wem, Clive Vicarage ...	·71	,,	Killarney, Woodlawn ...	2·91
,,	Wolverhampton, Tettenhall	1·16	,,	Caher, Duneske	3·10
,,	Cheadle, The Heath Ho.	1·65	,,	Ballingarry, Hazelfort...	1·97
,,	Coventry, Priory Row ..	·89	,,	Limerick, Kilcornan ...	1·96
VII.	Grantham, Stainby	·90	,,	Broadford, Hurdlestown	2·01
,,	Horncastle, Bucknall ...	1·03	,,	Miltown Malbay	4·30
,,	Worksop, Hodsck Priory	·45	XXI.	Gorey, Courtown House	3·12
VIII.	Neston, Hinderton	1·18	,,	Athlone, Twyford	2·96
,,	Southport, Hesketh Park	2·62	,,	Mullingar, Belvedere ...	2·80
,,	Chatburn, Middlewood.	5·11	,,	Longford, Currygrane...	2·13
IX.	Melmerby, Baldersby ...	·52	XXII.	Woodlawn	3·68
,,	Scarborough, Observat'y	·62	,,	Crossmolina, Enniscoe ..	3·53
,,	Middleton, Mickleton ...	2·87	,,	Collooney, Markree Obs.	2·64
X.	Haltwhistle, Unthank...	2·36	,,	Ballinamore, Lawderdale	6·55
,,	Bamburgh	·49	XXIII.	Warrenpoint.....	2·13
,,	Duddon Valley, Ulpha School	7·89	,,	Seaforde..	1·32
,,	Keswick, The Bank.....	4·48	,,	Belfast, Springfield	2·24
XI.	Llanfrechfa Grange	·79	,,	Bushmills, Dundarave..	1·43
,,	Llandovery	4·18	,,	Stewartstown	2·07
,,	Castle Malgwyn	2·72	,,	Killybegs	4·24
,,	Brecknock, The Barracks	·96	,,	Horn Head	2·55

JANUARY, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·73	— ·89	·30	5	9	55·0	30	29·2	11	2	8
II.		Tenterden	·69	— 1·21	·22	5	13	54·0	30	29·0	11	2	7
,,		Hartley Wintney	·73	...	·17	5	10	58·0	30	22·0	11	13	16
III.		Hitchin	·54	— 1·00	·17	4	10	54·0	20	26·0	10	8	...
,,		Winslow (Addington)	·68	— 1·13	·31	5	8	55·0	6, 21	28·0	11*c*	9	11
IV.		Bury St. Edmunds (Westley)	1·14	— ·33	·40	4	8	55·0	30	32·0	11	1	...
,,		Norwich (Brundall)	1·07	...	·35	4	14	56·0	5*b*	29·0	11	4	13
V.		Winterbourne Steepleton ...	1·06	...	·55	5	9	53·1	21	26·6	8	5	8
,,		Torquay (Cary Green)	·88	...	·35	20	6	55·9	21	35·6	8	0	2
,,		Polapit Tamar [Launceston]..	·90	— 2·12	·34	5	14	55·0	19*c*	24·4	14	4	7
VI.		Stroud (Upfield)	·32	— 1·88	·16	4	7	53·0	22	32·0	7*g*	3	...
,,		ChurchStretton(Woolstaston)	·69	— 1·47	·23	4	11	56·0	20	30·0	17	3	11
,,		Worcester (Diglis Lock)	·54	— 1·26	·25	4	11	...	..	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	·97	...	·41	4	15	57·0	19	26·0	4*h*	7	18
,,		Boston	1·05	— ·34	·45	4	7	55·0	20	30·0	10	6	...
,,		Hesley Hall [Tickhill].....	·47	— 1·30	·21	4	7	57·0	30	29·0	10	5	...
VIII.		Manchester(PlymouthGrove)	1·84	— ·62	·50	4	11	55·0	20*d*	32·0	29	1	4
IX.		Wetherby (Ribston Hall) ..	·52	— 1·37	·20	2, 5	5	...	...	...	...	...	...
,,		Skipton (Arncliffe)	7·66	+ 2·02	1·26	30	16	...	...	...	...	...	...
,,		Hull (Pearson Park).	·73	— 1·04	·25	4	8	56·0	30*a*	29·0	10	6	10
X.		Newcastle (Town Moor)	·87	— ·94	·24	3	8	...	..	...	...	...	...
,,		Borrowdale (Seathwaite).....	16·08	+ 3·90	2·09	30	20	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·07	— 1·22	·60	5	15	...	...	...	...	...	...
,,		Haverfordwest	3·69	— ·73	·83	4	20	53·4	31	28·8	10	1	11
,,		Aberystwith (Gogerddan) ...	6·36	+ 2·83	2·04	5	12	50·0	12*d*	...	...	...	...
,,		Llandudno.....	2·32	+ ·04	·61	29	13	57·0	30	33·0	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·99	+ ·22	·56	18	16	55·0	19	29·0	23	2	...
XIII.		Edinburgh (Blacket Place)...	·84	...	·19	5	13	56·5	19	32·3	5	0	8
XIV.		Colmonell	2·51	...	·60	3	13	55·0	18*e*	32·0	1*i*	3	...
XV.		Lochgilphead (Kilmory).....	...	...	...	...	...	...	...	...	...	...	...
,,		Mull (Quinish).....	5·41	— ·26	·65	7	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·90	— 1·00	·60	22	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·70	— 1·27	·30	21	15	57·0	19	29·1	5	5	...
XVII.		Braemar	1·76	— ·93	·54	21*a*	14	54·2	19	23·3	5	9	21
,,		Aberdeen (Cranford)	1·07	...	·56	21	17	59·0	19	28·0	4, 9	9	...
,,		Cawdor (Budgate)	2·28	+ ·11	·78	21	18	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·72	— ·16	·92	22	14	...	...	...	...	..	...
,,		Glencarron Lodge.....	12·97	...	1·44	26	29	53·6	19	29·0	5	4	...
XIX.		Dunrobin	1·90	— ·56	·30	21	13	57·0	19	30·0	3	7	...
,,		S. Ronaldshay (Roeberry) ...	4·03	+ 1·08	·50	27	23	53·0	19	34·0	3, 5*f*	0	...
XX.	IRELAND.	Darrynane Abbey.....	4·58	...	1·80	4	20	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·35	— ·21	·98	2	15	54·5	12*f*	28·0	10	3	...
,,		O'Briensbridge (Ross)	3·85	...	1·33	4	12	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·04	+ ·14	1·12	2	12	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·79	— ·07	·50	2	14	60·8	30	31·9	1	1	3
XXII.		Ballinasloe	3·52	+ ·44	·59	4	19	54·0	30	32·0	2, 5	2	...
,,		Clifden (Kylemore)	6·67	...	·94	7	19	...	...	...	...	..	...
XXIII		Waringstown	1·70	— ·95	·34	4	14	56·0	19	33·0	1	0	7
,,		Londonderry (Creggan Res.).	1·95	— 1·47	·23	4	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·64	— ·38	·40	3	20	55·0	30	30·0	1	2	6

+ Shows that the fall was above the average ; — that it was below it.

a—*and 31.* *b*—and 6, 19. *c*—and 23. *d*—and 30. *e*—and 19. *f*—and 21. *g*—and 9, 28. *h*—and 8, 23. *i*—and 3, 22.

METEOROLOGICAL NOTES ON JANUARY, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Wells lower than ever, January having only twice been drier since 1864 (·31 in. in 1880 and ·59 in. in 1892). No snow and fewer frosts than even in 1884. Nine days with temp. over 50°. Mean max. 46°·6, or 2°·8 higher than in the similar mild, dry January of 1896; mean grass min. 36°·1, or 5°·8 higher. A remarkably calm month, with high barometer after 2nd and especially so from 10th to 30th. W. and N.W. gale on 30th and 31st. Duration of sunshine 37 hours 40 minutes; 15 days having none, and four more only a few minutes. Fog on 16th and 17th.

HARTLEY WINTNEY.—Remarkable for abnormal mildness, dryness and absence of rough weather. Mean max. temp. 47°·2. So mild was the month that the early spring flowers were in full bloom. Ozone registered on 12 days. Rainfall 1·72 in. below the average.

ADDINGTON.—With the exception of January, 1880, when only ·45 in. fell, the least January fall in 28 years. The temp. rose to, or above, 50° on ten days; no severe frost occurred, and there was no snow. On the 16th very thick fog all day and an intensely dark night. Vegetation in a very advanced state.

BURY ST. EDMUNDS, WESTLEY.—Very mild, but little sunshine. Vegetation very forward. High barometer from the 10th to 29th.

NORWICH, BRUNDALL.—Mean temp. 43°·1, being the highest recorded in January; 56° was reached three times and 55°·8 once, which value had only once before been recorded in January, viz., in 1884. Practically no R fell between the 5th and 29th. Garden flowers very forward. Foggy on 7 days. Gale from N.W. on 31st. Lunar halo on 31st.

WINTERBOURNE STEEPLETON.—Bar. very high from the 10th to the end of the month. Temp. also unusually high, the mean for the month, 44°·1, being the highest in six years. Mean relative humidity at 9 a.m., 92. Average amount of cloud at the same hour, 9·7. Fog on 6 days.

POLAPIT TAMAR.—Remarkable for extreme mildness and general absence of sunshine, rain and wind. The driest January recorded in 18 years. Fog on 13th and 14th.

WOOLSTASTON.—A month of most unusual mildness, with very little rain and not much frost. Many spring flowers blooming. Mean temp. 42°·6.

ROTHERBY HALL.—There has been no other January since 1888 with a rainfall of less than one inch. The mean temp. of the month (43°) is exceedingly high for January, and the greater part of the month was dull and foggy, with very little sunshine. What little wind there was was from the S.W., but on the evening of 30th there was almost a gale. A slight flood on the 5th.

BOSTON.—Mean temp. 5°·7 above the average for 30 years.

MANCHESTER, PLYMOUTH GROVE.—Mean temp. 43°·4, the highest January temp. in the last 31 years. No snow, and slight frost on 4 days only. The weather very mild for the season.

WALES.

HAVERFORDWEST.—January was remarkable for persistent damp foggy air, gloom and mildness, and remarkably high bar. readings. On December 31st

the bar. corrected stood at 29·139 in., it then rather rapidly rose, and although it varied, undulating like an ocean swell, it always kept at a great height, reaching its maximum, 30·647 in., on January 23rd. During the whole time R or mist and excessive damp prevailed. Primroses and other spring flowers in bloom. Prevailing wind S.W.

ABERYSTWITH, GOGERDDAN.—Very damp and mild throughout, with very little sunshine.

LLANDUDNO.—Lunar halos on 9th and 31st. Hoar frost on 10th and 15th. Stormy on 18th.

SCOTLAND.

CARGEN [DUMFRIES].—The exceptional mildness of the winter continued through January, the mean temp., 44°·5, being the highest ever recorded at this station; on only two days did the temp. fall below freezing-point, while the maximum exceeded 50° on 14; 55°, the highest ever reached here in January, being registered on 19th. The mildest Januaries during 39 years are—1866, 41°·2; 1874, 42°·1; 1875, 41°·5; 1882, 43°·1; 1884, 42°·6; 1890 42°·0; January, 1898, exceeding the highest previously recorded by 1°·4. The bar. pressure was very high; only in five years has the mean been higher since 1860. Notwithstanding this, the month was unusually gloomy, only 30 hours of sunshine being recorded, while 18 days were sunless. Light westerly winds prevailed on 20 days. Vegetation is unusually forward.

EDINBURGH, BLACKET PLACE.—Mean temp. 44°·6, being the highest January mean recorded since the commencement of temp. observations in 1764. The previous mildest January was in 1796, mean temp. 43°·8. The shade temp. never descended to 32°, which is absolutely unprecedented, while the mean on 30th, 52°·0, is the highest during 100 years. No snow fell. Mean pressure ·290 in. above average. Rainfall barely one-third of the mean. Rather strong winds during the second half of the month; S.W. gale on the 18th.

COLMONELL.—Rain 2·05 in. below, and mean temp. 8°·5 above, the average of 22 years.

S. RONALDSHAY, ROEBERRY.—A wet, mild month. Mean temp. 43°·0, or 5°·4 above the average.

IRELAND.

DARRYNANE ABBEY.—A very mild month, and on the whole dry.

WATERFORD, BROOK LODGE.—Mean temp. 8°·3 above that of January, 1897.

O'BRIENSBRIDGE, ROSS.—No frost. Mean temp. unusually high. Premature vegetation and March flowers in bloom at the end.

DUBLIN, FITZWILLIAM SQUARE.—January, 1898, establishes a record for high temperature; the mean, 47°·8, being 1°·2 above the value for the warm January of 1875, and 6°·4 above the average. The atmosphere was foggy on 8 days. High winds occurred on 8 days, reaching the force of a gale on 4. There was no snow, sleet, or hail. Temp. exceeded 50° in the screen on 21 days; while it fell to or below 32° on only one night, compared with 13 nights in 1897, 3 in 1896, 18 in 1895, 7 in 1894, 4 in 1893, 15 in 1892, 7 in 1891, 1 in 1890, and 3 in 1889. Solar halos were seen on the 1st and 2nd; lunar halos on the 1st, 3rd, 9th and 31st.

WARINGSTOWN.—The mildest January remembered, but, strange to say, snowdrops, crocuses, &c., were not as early as usual.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable Publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXVI.] MARCH, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

WEST OF ENGLAND SNOW STORM, FEBRUARY 21ST.

AFTER a winter which had been such chiefly in name, the residents in parts of Hampshire, Dorset, Devon and Somerset found themselves on the morning of February 22nd surrounded by S of unusual depth.

Speaking roughly, the fall may be said to have commenced about 5 p.m. on the 21st, and to have lasted until noon on the 22nd, but in most districts by far the greater part occurred before 9 a.m. on the 22nd, and, therefore, in the rainfall "day" of February 21st.

We have extracted (1) from the notes of correspondents the principal facts recorded by them, and (2) from the local and other newspapers their reports as to the depth of the S, and as to damage, and (3) we give a summary of what appears to us to have been the general depth and distribution.

EPITOME OF OBSERVERS' NOTES.

Ryde (*Thornbrough*), R, S and T, total 0·82 in.
Emsworth (*Redlands*), R, S and T, total 0·58 in.
Hartley Wintney, S, total 0·03 in.
Salisbury (*West Dean*), S, total 0·31 in.
Bishop's Cannings, S, total 0·27 in.
Marlborough (*Mildenhall*), S, about 4 or 5 in., total 0·27 in.

Winterbourne Steepleton.—A heavy fall of S between noon of 21st, and midday of 22nd. It was not accompanied by much wind, therefore the drifts were not great, but roads between walls were stopped by S, and postal arrangements much delayed. (S began between 3 and 4 p.m., and by 10 p.m. the fall had been heavy, the total fall by noon on 22nd had been about 18 in.), measured 1·61 in. for 21st, and ·11 in. for 22nd.

Poole (*Parkstone*).—At 9 a.m. on 22nd there was 18½ in. of S round the rain gauges, and it was still falling, so I delayed digging them out until 11 a.m. when it ceased, and the total depth was 19½ in. This was by far the heaviest S since the celebrated fall of January, 1881, but the character was quite different; in 1881 it was very fine and dry, the present fall has been large-flaked and wet, and the damage to trees and shrubs has, consequently, been excessive. Total 1·98 in.

Blandford (*Whatcombe*).—Heavy S storm on night of 21st-22nd, total 1·62 in.

Ashburton (*Druid*).—Heavy S afternoon and evening of 21st, depth at 5 p.m., 8 in. ; morning of 22nd deep S yielding 1·02 in.

Tavistock (*Statsford*).—S at 9 a.m. on 22nd, 6½ in. deep, yielded 0·57 in. On Dartmoor there were drifts 15 ft. deep.

Polapit Tamar [*Launceston*].—Thick S yielded 0·32 in.

Honiton (*Otterhead*).—The total depth of S varied from 1 ft. 9 in. to 1 ft. 11 in., and the yield was 1·75 in., of which about 1·40 in. would belong to the 21st.

Wellington.—Exceptional S during the night of the 21st, the S at 9 a.m. on 22nd was about 18 in. deep, and yielded 1·04 in. Much damage done to evergreens.

Taunton (*Halse*).—S quite 2 ft. deep.

N. Cadbury.—Heavy S from about 5 p.m. on 21st to noon on 22nd, total depth, 7 or 8 in., yield up to 9 a.m. on 22nd, 0·52 in. It seems evident that though the S was so heavy at Taunton, very little fell round Bridgwater or to the N. thereof.

Lechlade.—Slight S yielded 0·12 in.

Campden (*Hidcote*).—S yielded ·02 in.

EPITOME OF PRESS NOTICES.

HANTS.

Cowes.—TS in evening, and S at night, which melted early on 22nd.

Bournemouth.—This is considered to be the heaviest S for 17 years, and more disastrous than even that of 1881. Owing to the wetness of the S it clung to the telegraph and telephone wires, and not merely broke them, but in many cases, by the great weight, pulled over the wrought-iron pillars which carried them. In the morning of the 22nd, not one wire could be worked. Many thoroughfares were blocked by fallen trees and by wires.

DORSET.

Blandford.—S fell for 18 hours, and there are drifts many feet deep. Between Blandford and Bournemouth nearly all the telegraph wires are broken.

Bridport.—This town has been quite isolated, the Lyme Regis omnibus could not get here for two days, and our telegrams have been sent by train to Weymouth and wired from there.

Dorchester.—Telegraph and telephone posts are down in all directions, the S drifts vary from 8 ft. to 12 ft., and one man overtaken by the storm, died in it. The mail carts could not leave.

Hawkchurch.—The average depth of S (2 ft.) was greater than in 1891, but the drifts this year were not so great ; although quite sufficient to block the roads until they were cut through.

North Curry.—S stopped telegraphic communication, and the mails were several hours late.

Poole.—Even before midnight of 21st, some of the telegraph and telephone wires and posts had been broken by the weight of the S ; but in the morning the wreckage proved to be general, and in

several cases the wires had carried away tiles and portions of chimneys. Glass and iron roofs also gave way under the load.

Shaftesbury.—The road to Sembley entirely blocked by S.

Weymouth.—Unusually heavy S; great damage to telegraph and telephone wires and posts, and the railway between Upwey and Abbotsbury so blocked that a snow plough had to be fetched.

Wimborne.—All telegraphic communication stopped; and the roads blocked with S and by broken trees.

Wrantage.—The mail cart from Taunton stuck in a snow drift, and had to be dug out.

Yetminster.—Railway blocked.

DEVON.

Ashburton.—S twelve inches deep.

Brixham.—Most of the S melted as it fell, but on the hills it was a foot deep, and there were drifts of 3 ft.

Chagford.—S more than 1 ft. deep, but not much drifted.

Dartmouth.—S many inches deep. Trees, telegraph and telephone wires down, and traffic deranged.

Dawlish.—S nearly 6 in. deep.

Exeter.—Many telephone wires broken by heavy S.

Exmouth.—S about 4 in. deep.

Honiton.—S quite 14 in. deep, and traffic stopped, the roads being impassable. The heaviest S since March, 1891.

Ivybridge.—The 8.30 a.m. mail train from Plymouth ran into a drift near Wrangaton, and had to stop for an hour until a gang of men had dug it out.

Kingsbridge.—S in places two or three feet deep. Traffic stopped, and some tradesmen did not take down their shutters.

Moretonhampstead.—S about 1 ft. deep.

Newton Abbot.—The average depth of S here was 8 in.

Plympton.—A man lost his way in the S, and died from exposure.

Plymouth.—In the town the average depth was 3 in. or 4 in., and in drifts 1 ft. to 1 ft. 6 in.

Princetown.—In intensity this S has equalled 1891, but it did not last so long, and, except by telegraph, we have been isolated from the world for two days. Four locomotives with two ploughs were many hours trying to clear the railway. From Stenlake to Goatstone Hill the S on the roadway was 18 ft. deep; near the prison gates the S was 15 ft. deep.

Sidmouth.—S several inches deep, which broke telegraph and telephone wires. Man found dead in the S.

South Brent.—Drifts of S from 6 ft. to 7 ft. Mail cart stuck, so the driver left it, and rode on with the letter bags.

Starcross.—S about 6 in. deep.

Tiverton.—S 1 ft. deep, and no railway open except the Exe Valley.

Torquay.—Total depth on ground 3 in. or 4 in.

Totnes (*Broadhempston*).—S generally about 1 ft. deep, but in drifts quite 4 ft., the greatest since 1891.

CORNWALL.

Bude.—No S to lie, except upon the hills.

Camelford (St. Tudy).—S about 2½ in. deep, but a thaw followed.

Fowey.—In the early morning the hills were white with S, but the sun soon melted it.

Fowey (Polperro).—S at times covered the ground, but soon melted.

Lostwithiel.—Some S, but it soon melted.

SOMERSET.

Bath.—S 3 in. or 4 in. deep; traffic interrupted, 150 men and 120 carts employed to clear it away.

Castle Cary.—Drifts from 3 ft. to 6 ft. deep.

Chard.—S drifts 10 ft. to 12 ft. deep; great damage to fine trees.

Cranmore.—The first up train on the E. Somerset line stuck in a drift and had to be dug out.

Ilchester.—The mail cart with two horses stuck in a S drift. Eventually the bags were sent on on one horse, and the cart was dug out and sent on with the other.

Ilminster.—S considerably over 1 ft. deep.

Langport.—S quite 5 in. deep.

Taunton.—Very heavy S, at least 2 ft. deep, and much more where drifted. Roads blocked, and nearly all the telephone wires broken.

Wellington.—S 2 to 3 ft. deep, railway to Burlescombe blocked, and considerable damage done to trees and roofs.

Wiveliscombe.—Excessive S, in places 3 or 4 feet deep, and on the Brendon Hills the roads are full up level with the hedges.

Yeovil.—Very heavy S, fully a foot deep, and much more in places. It was very heavy, and damaged wires, roofs and skylights.

SUMMARY.

By plotting the above statements upon a large scale map they are seen to agree remarkably well.

The S was quite unimportant, except in the Counties which we named on a previous page, viz., Hants, Dorset, Devon and Somerset.

Devonshire requires separate mention because, apparently, the depth of the S in two parts of that county was due to different causes. In N.E. Devon the fall was part of the exceptional fall of which we are going to speak further, but the heaviness of the fall on Dartmoor, and on its eastern edge, was, we believe, chiefly due to the chilling effect of that mass of high land.

Omitting that area, the facts, according to all information yet received, seem clearly marked, and any map (Bradshaw's, for instance) will enable them to be realized.

The fall reached, or exceeded, 12 inches over the area contained between two lines, the northernly one running about E.S.E. from Watchet, through Yeovil to Lymington, and the southernly one from Porlock, through Tiverton to Bridport; say, 60 miles by 20 miles.

The greatest depth, about 24 inches, occurred nearly centrally in this belt, say, between Milverton and Crewkerne.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

FEBRUARY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 A.M. and 9 P.M.						Extremes at 9 A.M. and 9 P.M.				Mean of all Highest	Mean of all Lowest.
					Mean.	Highest Month.		Lowest Month.		Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	30·003	30·480 1891	29·537 1879	9 a.m.	30·004	30·481	1891	29·538	1879	30·854	23rd, 1883	28·761	21st, 1893	30·520	29·313
				9 p.m.	30·003	30·478	1891	29·536	1879	30·770	23rd, 1883	28·767	21st, 1893	30·498	29·324
Shade Temp. Dry Bulb	39·5	45·6 1869	28·8 1895	9 a.m.	39·2	45·8	1869	28·1	1895	54·0	11th, 1869	15·2	9th, 1895	49·6	28·4
				9 p.m.	39·7	45·5	1869	29·6	1895	54·0	6th, 1866	17·2	7th, 1895	49·6	29·4
Shade Temp. Max.	45·5	..	...	...	...	51·7	1869	36·1	1895	62·5	25th, 1868	24·2	8th, 1895	55·2	35·3
Shade Temp. Min.	34·7	...	...	...	...	40·6	1869	22·5	1895	51·2	1st, 1869	7·3	8th, 1895	45·4	24·1
Shade Temp. Wet Bulb	38·0	43·8 1867	27·8 1895	9 a.m.	37·8	43·8	'67, '69	26·9	1895	53·6	11th, 1869	14·8	8th & 9th, '95	48·0	27·6
				9 p.m.	38·3	43·7	1867	28·6	1895	52·0	28th, 1878	17·0	7th, 1895	48·0	28·4
Solar Rad., black	63·2	...	...	...	...	74·1	1877	51·9	1886	102·4	23rd, 1871	29·8	11th, 1876	89·0	39·9
Solar Rad., bright	49·2	...	...	...	...	54·2	1885	41·2	1895	69·8	28th, 1883	30·0	7th, 1895	62·4	36·9
Grass Minimum	31·5	...	...	...	...	38·3	1869	19·0	1895	49·9	11th, 1869	5·0	9th, 1895	43·2	20·0
Soil, 1 foot	38·9	...	...	...	...	43·1	1872	32·3	1895	46·0	15th, 1877	30·9	18th, 1895	42·3	35·6
Cloud	6·8	8·9 1873	5·2 1858	9 a.m.	7·1	8·7	1873	5·3	1859	10	Every year	0	Various	10·0	0·6
				9 p.m.	6·5	9·1	1873	4·4	1866	10	Every year	0	Various	10·0	0·3
Rainfall	1·61	3·77 1879	·01 1891	9 a.m.	·87	2·28	1883	·00	1891	·62	15th, 1890	·00	Every year	·29	·00
				9 p.m.	·74	1·75	1879	·01	1891	·60	10th, 1879	·00	Every year	·24	·00

Max. Rainfall in 24 hours, ·76 in., 10th, 1879 Mean max. daily fall, ·40 in.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday, February 16th, at the Institution of Civil Engineers, Westminster, Mr. F. Campbell Bayard, LL.M, President, in the chair.

The following candidates were elected Fellows of the Society:—Charles Henry Gatty, M.A., LL.D., F.R.S.E.; Rev. G. T. Laycock, F.R.H.S.; Joe Harry Webb, C.E. *Honorary Members*:—Walter G. Davis, Director of the Oficina Meteorologica Argentina, Cordoba, Argentina; Dr. J. P. Van Der Stok, Director of the Magnetical and Meteorological Observatory, Batavia.

Mr. E. Mawley, F.R.H.S., read his report on the Phenological Observations for 1897, from which it appeared that there had been a marked absence of very exceptional weather during the past year, the most noteworthy features affecting vegetation being the persistent rains in March, and the three dry periods of May, July and October. Until about the middle of May wild plants appeared in blossom in advance of their usual time, but throughout the rest of the season they were all somewhat behind their average dates in coming into bloom.

The heavy rainfall in the early spring favoured the hay (which proved the only really abundant farm crop of the year), but it greatly impeded the sowing of spring corn. The cereals were, however, much benefited later on by the warm, dry and brilliant weather of the summer. Taking the country as a whole, oats proved a good crop, barley an average one, while the yield of wheat was somewhat under average. There were also fair crops of roots and potatoes. It was owing more to the dry spring and summer, and the sunless autumn of the previous year than to the moderate frosts and cold winds of the spring of 1897 that the fruit crop was so very light. Apples, pears and plums, especially the latter, yielded badly, while the small fruits were in most districts only average crops.

In the discussion which followed, the President suggested that the observations of the habits of insects would yield a very interesting diagram similar to those based on the records concerning birds; he also spoke of the weather of Jubilee year (1887) as being similar to that of 1897.

Mr. Curtis referred to the heavy gale in the south-western counties on Ash Wednesday, and quoted the record of the Dines' anemometer at Rousdon, showing a velocity of 100 miles an hour, the greatest ever recorded in the British Isles.

Mr. Symons hoped that some reference to the storms of March 3rd and June 24th would appear in the publications of the Society, and spoke of the destruction of trees round Salisbury in the former gale, which died out about Alton in Hampshire.

Mr. Marriott exhibited lantern photographs of damage wrought by the Essex storm, and said that the wind was the more remarkable feature of the storm than the hailstones.

Mr. J. Hopkinson, F.L.S., F.G.S,, read a paper on "Monthly and Annual Rainfall in the British Empire, 1877-1896."

From the Climatological Tables which appeared at first in *The Colonies*, and subsequently in the *Met. Mag.* the author had tabulated the rainfall at London, Mauritius, Calcutta, Bombay, Colombo, Adelaide, Melbourne, Wellington, Toronto and Winnipeg for the 20 years 1877-96, and at Malta and Jamaica for the 10 years 1887-96.

Tables I.-XII. give the mean monthly and annual rainfall, and the number of days on which at least 0·01 in. of rain fell at these 12 stations, and also the maximum and minimum monthly and annual rainfall, and the number of days of rain.

A summary of the yearly rainfall at the whole of the 12 stations is given in Table XIV., which we reproduce.

TABLE XIV.—*Mean and Extreme Yearly Rainfall, and Number of Days of Rain at* 10 *Stations in the British Empire for Twenty Years, and at* 2 *for Ten Years.*

MONTHS.	MEAN.		MAXIMUM.		MINIMUM.	
1877-96.	in.	Days.	in.	Days.	in.	Days.
London	25·76	164	34·09	195	19·21	137
Mauritius	50·38	203	68·17	241	29·74	174
Calcutta	59·20	116	85·23	143	39·38	74
Bombay	76·71	111	111·93	124	57·82	102
Colombo	91·82	179	139·70	215	60·55	128
Adelaide	20·56	135	30·87	164	14·01	113
Melbourne	24·52	132	32·39	153	17·06	116
Wellington	51·22	170	67·68	191	31·37	137
Toronto	31·49	177	48·51	206	24·83	143
Winnipeg	21·22	127	29·33	159	14·64	88
1887-96.						
Malta	20·50	79	26·04	90	11·38	59
Jamaica	29·16	85	40·81	97	19·01	78

Mr. Baldwin Latham remarked that the results for the stations in the paper agreed very closely with the rule recognised for this country, that one-third added to the mean annual rainfall gives the maximum yearly fall, and one-third taken from the mean gives the minimum.

Mr. Chadwick referred to the variation of fall in the different countries, and to the precise location of some of the Observatories, urging the caution that the falls given for many of the stations must not be assumed to apply to any very extended area.

Mr. Symons spoke of the paper as a plucky attempt at an impossibility; he reckoned very roughly that there were more than 25,000 rain gauges at work in the world, and it is impossible for one man to give a great *résumé* of all the records. He would like to see the many good local rainfall maps that exist, reduced to a uniform scale, and all brought together in one atlas.

Mr. Hopkinson, in reply, said he had not attempted to give the mean rainfall of each country, but simply to summarise the tables on which the paper was based, and to give the records for a long concurrent period for as many stations as possible.

REVIEW.

Der Tägliche Wärmeumsatz im Boden, und die Wärmestrahlung zwischen Himmel und Erde von DR. THEODOR HOMÉN. 4to., Leipzig Wilhelm Engelmann, 1897, 148 pages and 10 plates.

WE had the pleasure of calling attention to Dr. Homén's work upon "Earth Temperature" on page 45 of the *Met. Mag.*, vol. xxx. In the book before us he carries it farther and endeavours to measure, not merely the penetration of solar heat into soils of several varieties, but also to establish a sort of Debtor and Creditor account between the heat imparted by the sun, and that dissipated into space by radiation.

We pointed out on the previous occasion, that "A sketch of one or two of his thermometers in position, a process photo of one of his experimental groups, and an outline plan showing the sites of the observations, would have made it more easy to appreciate fully the conditions of the experiments." Dr. Homén has given us the third, but not either the first or the second—and perhaps it is our own fault for not more forcibly dwelling upon their necessity—but we still do not clearly understand the precise mounting of his thermometers, especially as to the precautions taken to ensure that the penetration of rain to the point occupied by the thermometer bulb is neither less nor more than that penetrating to the same depth in other places. Dr. Homén takes so much pains to ensure accuracy in other respects that doubtless he has done so in this, but the difficulty is an old one, and full details as to how he has conquered it would be useful to many observers.

Again, with regard to the thermometers, if we understand correctly they are, in order to facilitate reading, set at an angle with the vertical, but with their bulbs at the true vertical depth, the plan adopted at the Royal Botanic Gardens, Regents Park, (See engraving, *Met. Mag.*, vol. v, p. 102,) but this brings the weight of the observer's body many times a day as a compressing influence upon the soil almost over the bulbs, and we are not sure that this does not affect its permeability. Another point upon which an engraving would have given more information than half a page of text is the extent to which the temperature of the buried bulb could have been affected by the scale exposed above ground. Dr. Homén shows the pains which he took to correct the long thermometers for the temperature through which their stems passed, but he does not enable us to see clearly the details of his work, which would doubtless have been very instructive.

It is the province rather of a skilled physicist than of an ordinary meteorologist to follow the latter portions of Dr. Homén's work in which he determines the number of Calorics received by, and dissipated from, the earth, but one is constantly coming upon facts and data of interest. For instance, on pages 93 to 95 there are the results of a series of readings, day and night, of an hygrometer with an Assmann aspirator, read at the level of the ground, and at 3, 7, 16 and 33

feet above it, showing very well the increased range of temperature experienced near the ground.

The observations were made on several days, but those of one day will show the general features better than a long description.

	Air Temperature.					Dew Point Temperature.				
	0 ft.	3 ft.	7 ft.	16 ft.	33 ft.	0 ft.	3 ft.	7 ft.	16 ft.	33 ft.
	°	°	°	°	°	°	°	°	°	°
Aug. 11, 3.0 a.m.	41·0	45·0	46·4	48·0	50·5	40·5	44·6	46·0	47·5	49·6
4.15 ,,	35·2	40·3	42·8	45·9	49·6	34·9	39·2	42·1	45·1	49·1
5.15 ,,	41·9	41·5	44·1	46·4	49·5	41·7	41·0	43·5	46·0	48·7
6.15 ,,	53·6	52·5	50·9	51·4	51·8	50·9	49·5	48·9	48·9	49·6
7.30 ,,	62·4	59·0	58·5	57·2	56·8	55·4	52·2	51·6	50·9	50·9
8.15 ,,	66·2	61·3	61·2	60·3	59·4	59·2	53·6	52·3	51·8	51·1
10.15 ,,	70·0	65·8	64·9	64·4	64·0	61·2	51·4	50·4	49·5	49·1
0.15p.m.	69·4	67·3	66·9	66·2	66·2	58·1	46·4	46·0	45·7	45·7
2.15 ,,	73·2	68·5	67·8	67·5	67·5	59·4	46·8	45·5	46·0	45·1
4.15 ,,	70·5	68·7	68·0	67·8	67·6	55·0	47·5	47·1	47·1	46·4
6.15 ,,	63·0	65·7	65·8	65·5	65·5	50·9	45·1	44·2	44·6	44·2
7.15 ,,	55·4	60·3	62·4	63·7	64·2	51·3	47·5	47·5	46·4	46·8
8.15 ,,	47·7	53·6	55·0	60·1	61·9	45·7	46·4	47·5	47·1	46·8
9.15 ,,	43·2	47·3	50·0	54·7	58·6	42·1	46·0	46·8	45·4	45·1
10.15 ,,	40·8	45·1	45·9	50·5	54·7	39·2	43·9	44·2	46·8	46·8
Aug. 12, 0.15a.m.	37·2	40·5	41·4	44·1	48·9	36·5	39·2	40·1	42·8	46·0
Max.	73·2	68·7	68·0	67·8	67·6	61·2	53·6	52·3	51·8	51·1
Min.	35·2	40·3	42·8	45·9	49·6	34·9	39·2	42·1	44·6	44·2
Range	38·0	28·4	25·2	21·9	18·0	26·3	14·4	10·2	7·2	6·9

Many things, often forgotten, are illustrated by this little table, *e.g*, the enormous effect of the soil upon the temperature of the air.

We see that shortly before sunrise the temperature is nearly the same at all elevations, but that as the sun gets power the surface temperature rushes *above* all the others and remains so till about sunset, then terrestrial radiation becomes preponderant, and in the early morning hours the temperature near the surface is from 10° to 14° *below* that at 33 feet.

Most of this difference is very close to the earth's surface. If we take out the range of temperature at each elevation, and then take the differences for each interval the result is very marked.

		Difference.	Difference for each foot.
	°	°	°
Range at the surface	38·0	..... 9·6	3·2
,, ,, 3 feet	28·4	..... 3·2	·8
,, ,, 7 ,, ...	25·2	..... 3.3	·4
,, ,, 16 ,, ...	21·9	..... 3·9	·2
,, ,, 33 ,, ...	18·0		

Another very marked feature is the dryness of the air at 16 feet, and especially at 33 feet, during the evening and early night hours,

the humidity being from 20 to 30 per cent less than near the surface. Well may persons speak of the "mists rising" when we see the humidity at the surface from 8.15 p.m. to 10.15 p.m. averaged 94, whereas at 7 feet it averaged 84, at 16 feet 73, and at 33 feet only 65 per cent, 29 per cent less.

BUYS-BALLOT.

On page 119 of our last volume we mentioned the desire of the successors of Dr. Buys Ballot that a bust of him should be erected at the New Meteorological Institute at Utrecht, and that it should be erected mainly by International Subscription. We concluded by saying that "Our personal view of the matter is that no very large sum is required, but that the greater the number of contributors, the more would it be evidence of the esteem in which the deceased was held."

We did not receive a single shilling.

Dr. Snellen has sent us circulars which we shall be happy to forward to anyone interested, but they do not contain much more information than is given above, and in the previous notice.

All desiring to take part in this testimonial are requested to send their contributions during the month of March (as the list is to close on April 1st,) either to Dr. Snellen, de Bilt, Utrecht, or to G. J. Symons, 62, Camden Square, N.W.

THE AUSTRALASIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE.

The seventh session of the Australasian Society for the Advancement of Science was opened at Sydney on January 6th, 1898, when Prof. A. Liversidge, M.A., LL.D., F.R.S., who is both President and Secretary, delivered the inaugural address to a large audience. The *Daily Telegraph* (Sydney) has devoted much space to the proceedings of the meeting, and from that paper we are able to cull some items of interest. Among the most important of the papers read were the following:—

Seismological Committee.

This report was presented by the secretary, Mr. George Hogben, M.A., of Timaru, New Zealand, and stated that the most interesting result of the labours of the observers was the fact, based upon rough calculations, that the great South Australian earthquake of May 10th, 1897, proceeded from a line parallel to the coast near Beachport and Kingston, and was possibly due to a sliding of one part of the crust upon another, such as forms what is called in geology a "fault." This was probably deep, but the later and slighter shocks were surface ones, caused by readjustments of the immediate crust. The subject was still under investigation by the secretary. But Mr. Hogben pointed out that it was as part of a world-system of seismological observations that the work of the committee might be most useful. An international seismological committee had been set up, embracing all the ablest workers in every part of the world, and in co-operation with that committee were committees of the

British Association and of the Royal Society. They desire especially to be able to track the microseismic vibrations or minute earthquake waves, which travelled from the sources of disturbance all round the earth's surface, or it might be right through the solid mass of our world (if it is solid). The speed of these finer waves was many times greater than that of the larger waves felt by us, reaching a velocity as great as 12 miles per second, or even more. For the purpose of observing them the international committee had agreed upon a certain type of instrument—the horizontal pendulum—to be used by all stations alike, as it was important that instruments of the same kind and of the same degree of sensitiveness should be employed for purposes of comparison.

Periodic Waves.

Mr. H. C. Russell, F.R.S., the Government Astronomer of New South Wales, read a paper on "The Source of the Periodic Waves, sometimes called Earthquake Waves, which reach Sydney from time to time." The author stated that these waves were recorded very frequently in Sydney, and had the same period as the waves known to be caused by earthquakes—that was about 26 minutes from crest to crest; but it was shown that only about 1 per cent. of them originated in earth movements, and that 60 per cent. originated in Bass' Straits, when the meteorological condition known as a low pressure arrived at that part of Australia. The effect of low barometers was to cause a rise in the sea level, to provide for which currents set in along the south and east coasts of Australia, which, meeting in Bass' Straits, produced waves, and set them going in Tasman Sea, whence they were recorded on the Sydney and Newcastle tide gauges. It was also shown that at least another 10 per cent. of these waves originated in the Tasman Sea by the action of heavy gales. That was, in all 70 per cent. of the periodic waves originated from meteorological disturbances, and probably the remainder were due to these causes, although the connection had not yet been actually traced. Reference was made to Lake George, where somewhat similar periodic waves were frequent, and all were traced to meteorological causes.

Cloud Heights and Velocity.

A paper on "The Measurements of Cloud Heights and Velocity" was read by Mr. P. Baracchi, F.R.A.S., Government Astronomer in Victoria. The year 1897 had been called by some writers on meteorological subjects "the cloud year," on account of the systematic observations of clouds which were carried on in nearly all the civilised countries during that period, under a scheme laid out and finally agreed upon in all its detail by the International Meteorological Committee at its Upsala meeting of 1894. The object of the scheme was to obtain more uniform and comprehensive data to serve as the basis for the further study of atmospheric conditions, as indicated by the forms and movements of clouds. After a brief reference to the methods adopted in Victoria for securing results anticipated by the scheme, Mr. Baracchi said there were now some 20,000 observations ready. For the determination of absolute height and velocity two stations for simultaneous observations were established, one being on the grounds of the Melbourne Observatory, and the other on the roof of Parliament House at a distance of 6,820 ft. After consideration he adopted the photographic method which had been successfully employed at the Kew Observatory some years ago.

(To be concluded in our next.)

FEBRUARY, 1898.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. Nights below 32° In shade.
		inches.	inches.	in.							
I.	London (Camden Square) ...	1·08	— ·80	·15	3*e*	14	56·2	1	24·3	21	7
II.	Tenterden	1·08	— 1·04	·16	18*a*	13	56·0	1	22·0	21	9
,,	Hartley Wintney	1·33	...	·28	19	16	56·0	17	18·0	21	17
III.	Hitchin	1·11	— ·64	·26	27	17	53·0	1	23·0	20	9
,,	Winslow (Addington)	·95	— 1·21	·20	3	15	53·0	1	23·0	21	13
IV.	Bury St. Edmunds (Westley)	·95	— ·61	·20	3	13	56·0	1	25·0	22	...
,,	Norwich (Brundall)	1·22	...	·39	3	17	60·2	1	22·4	22	6
V.	Winterbourne Steepleton ...	2·99	...	1·61	21	20	52·2	1	18·1	25	11
,,	Torquay (Cary Green)	2·24	...	1·20	21	15	56·1	1, 18	29·5	24	6
,,	Polapit Tamar [Launceston]..	2·83	— ·44	·39	3	23	53·4	11	22·1	24	7
VI.	Stroud (Upfield)	1·36	— 1·20	·25	18	16	52·0	15*b*	27·0	24	13
,,	ChurchStretton(Woolstaston)	2·26	— ·19	·45	3	20	54·0	1	23·5	21	10
,,	Worcester (Diglis Lock)	1·35	— ·62	·22	17	19	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	1·11	...	·17	3	19	56·0	16	19·0	21*c*	12
,,	Boston	·46	— 1·22	·12	3	11	52·0	1	24·0	21	...
,,	Hesley Hall [Tickhill].....	·59	— ·91	·26	28	11	57·0	1	22·0	21*a*	9
VIII.	Manchester(PlymouthGrove)	2·17	+ ·12	·30	28	21	58·0	1	21·0	20	10
IX.	Wetherby (Ribston Hall) ...	1·04	— ·54	·33	28	13	...	...	...	...	...
,,	Skipton (Arncliffe)	8·32	+ 3·63	·91	1	21	...	...	...	...	...
,,	Hull (Pearson Park).	1·52	— ·28	·45	3	15	56·0	1	24·0	21	15
X.	Newcastle (Town Moor)	1·06	— ·34	·24	4	11	...	...	...	...	...
,,	Borrowdale (Seathwaite).....	16·48	+ 3·84	1·55	9	23	...	...	...	...	...
XI.	Cardiff (Ely).....	2·37	— ·82	·31	20	20	...	...	...	...	...
,,	Haverfordwest	1·91	— 2·21	·36	25	21	53·1	1	23·2	24	4
,,	Aberystwith (Gogerddan) ...	3·15	— ·11	·64	5	16	51·0	10	...	...	...
,,	Llandudno.....	2·28	+ ·36	·37	3	21	57·5	1	28·0	21	2
XII.	Cargen [Dumfries]	4·67	+ 1·02	·61	6	18	54·6	1	23·0	24	10
XIII.	Edinburgh (Blacket Place)...	1·02	...	·21	1	13	55·5	1	24·0	21	8
XIV.	Colmonell	6·39	...	1·06	25	21	53·0	10	21·0	20	...
XV.	Tighnabruaich	7·59	...	1·10	26	22	50·0	2	28·0	20*d*	10
,,	Mull (Quinish).....	6·80	+ 1·33	1·40	26	21	...	...	...	...	...
XVI.	Loch Leven Sluices	2·00	— ·75	·40	2	10	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	·75	— 1·35	·35	25	11	55·2	15	22·4	24	14
XVII.	Braemar	2·38	— ·98	·47	21	20	51·8	1	2·5	24	20
,,	Aberdeen (Cranford)	1·60	...	·51	25	17	58·0	15	20·0	28	19
,,	Cawdor (Budgate)	3·35	+ 1·12	·33	12	23	...	...	...	...	...
XVIII	Strathconan [Beauly]	10·91	+ 6·20	1·90	2	15	...	...	...	...	...
,,	Glencarron Lodge.....	11·30	...	1·22	14	25	50·4	1	23·0	4	13
XIX.	Dunrobin	4·81	+ 2·72	·52	1	23	53·0	1	27·0	20	12
,,	S. Ronaldshay (Roeberry) ...	5·20	+ 2·56	·81	25	25	50·0	15	27·0	3	13
XX.	Darrynane Abbey.....	3·72	...	·53	20	25	...	...	...	...	...
,,	Waterford (Brook Lodge) ...	1·31	— 2·77	·28	25	20	53·5	17	22·0	24	8
,,	O'Briensbridge (Ross)	4·07	...	·52	4	22	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	1·54	— 1·54	·25	25	20	...	...	...	...	...
,,	Dublin (FitzWilliam Square)	1·74	— ·61	·58	17	18	59·0	1	28·1	24	7
XXII.	Ballinasloe	2·14	— ·64	·32	12	19	53·0	1	26·0	23	7
,,	Clifden (Kylemore)	10·05	...	·93	24	24	...	...	...	...	...
XXIII	Waringstown	2·50	+ ·05	·46	25	16	56·0	3	23·0	20	8
,,	Londonderry (Creggan Res.).	5·48	+ 2·45	·45	13	26	...	...	...	...	...
,,	Omagh (Edenfel)	4·18	+ 1·49	·59	17	24	54·0	1	25·0	21	9

ENGLAND. WALES. SCOTLAND. IRELAND.

+ Shows that the fall was above the average ; — that it was below it.

a—and 25. *b*—and 16. *c*—and 22. *d*—and 21, 23, 24. *e*—and 5, 18.

METEOROLOGICAL NOTES ON FEBRUARY, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

TENTERDEN.—Extraordinary deficiency of rainfall continued, the total for the five months ending February being only 6·36 in. A very similar month to February, 1896, the temp. almost identical, but more rain and the bar. not so high. Much colder and drier than 1897, with half the rainfall and nearly double the sunshine; total duration 91 hours.

HARTLEY WINTNEY.—The abnormal mildness which characterised the preceding month continued to the 18th of February, when a sudden fall of temp. and bar. pressure was followed by slight falls of S, which continued for about a week. Lesser celandine in flower on the 7th; brimstone butterfly on wing on the 9th. Ozone registered on 27 days. Rainfall half the average.

ADDINGTON.—Weather unsettled, but a small rainfall. Frost on a good many nights, but of no intensity. The temp. rose to or above 50° on 7 days; bar. very low on the 20th, 21st and 22nd. On the 18th S and sleet fell to the amount of ·11 in.

BURY ST. EDMUNDS, WESTLEY.—Much colder than January. R fell on only 13 days in very small quantities, and ponds and rivers are very low. TS on 27th.

NORWICH, BRUNDALL.—Mean temp. of the month 40°·7; mean temp. of the three winter months (December to February) 41°·3, the highest since 1876-7. Wind nearly continuously W. and N.W., and rough at times. Although generally very mild, a less genial month than January. Floods on the marshes, caused by N.W. winds, on 3rd. Lawn white with S on 4th. T, L, H and S on 5th; W.N.W. gale on 16th; H storms and a very bright rainbow on 20th.

WINTERBOURNE STEEPLETON.—The temp. up to the 18th was unusually high, with a high bar. A sudden change occurred on the 19th, followed by frosts and a heavy fall of S between noon of 21st and 22nd. Sunshine on 23rd and 24th began to melt the S, and the rain later rapidly reduced it. Squalls of sleet and S on 2nd; squally N.W. wind with sleet and R on 4th; sharp frost at night on 18th.

TORQUAY, CARY GREEN.—Rainfall 0·30 in. below the average of 22 years. Mean temp. 0°·7 above the average. Duration of sunshine 102 hours 45 mins., being 27 hours above the average; two sunless days.

POLAPIT TAMAR.—Generally mild and damp. The only period of really wintry weather for the season was in the last 8 days. The min. on grass on 24th fell to 18°. Stormy, with frequent H on 2nd; N.W. gale on 4th; H on 5th, 6th, 7th and 20th; S on 20th, 21st and 22nd.

STROUD, UPFIELD.—Gale from N.W. in evening of 2nd; slight S on 4th; S all day on the 18th, covering the hills, and about an inch on the ground on 20th.

WOOLSTASTON.—The early and latter parts of the month were cold and stormy, S falling lightly on several days, with a good deal of frost at night. Mean temp. 39°·0. S on 2nd, 3rd, 6th and 18th.

MANCHESTER, PLYMOUTH GROVE.—S and sleet on the 4th; H showers on 6th; S on 21st; dense fog on 22nd; thick fog on 24th. The last week or nine days very winterly. Mean temp. 39°·4.

WALES.

HAVERFORDWEST.—February commenced stormy, a gale beginning about 11 p.m. on the 1st and lasting until the night of the 4th, varying in force from fresh to strong. On the 5th the Precelly Range was snow-capped, and colder weather prevailed to the 8th, after which, up to the 18th, it was very mild, with continual damp. S fell on the 20th and 21st, followed by three days of hard frost, and then stormy, wet weather to the end of the month.

Although the rainfall was small, the weather, generally, was very damp, but there was not much fog. Daffodils in bloom, and brambles in leaf, on the 4th, and vegetation generally very advanced.

ABERYSTWITH, GOGERDDAN.—Sharp snowstorm on the 20th, melting as it fell.

LLANDUDNO.—Stormy on 2nd, 3rd, 4th and 19th; T, L and H on 2nd; S and H on 20th.

SCOTLAND.

CARGEN [DUMFRIES].—The mild weather experienced in January continued for only the first two days in this month, the mean temp. falling from 49° on the 1st to 39° on the 3rd. Exceptionally low temp. prevailed during the latter part of the month; the mean for the last 12 days being only 37°, while for the first 16 days it was 42°·5. More sunshine was registered than in any other February since 1876; the total duration being 111 hours, against an average for 39 years of 84. Slight S fell on 7th, 21st, and 28th. Westerly winds prevailed on 14 days. The district entirely escaped the very severe gale experienced at no great distance to N. and S. on the 2nd. Primroses and blackthorn were in bloom in the early part of the month, and the blossom of lilac and pear was bursting from the bud; birds were to be found sitting, and an instance of eggs having been actually hatched is recorded. The forward state of vegetation received a seasonable check towards the end of the month.

EDINBURGH, BLACKET PLACE.—Mean temp. 1°·2 above the average. Rainfall only half the normal, while the bright sunshine recorded—90 hours—is the greatest in February since 1880. S.W. gale on 1st, W. gale, with H, on 12th. TS, with heavy H and S, 3.30 p.m., on 6th. S on 21st and 26th.

COLMONELL.—Rain 2·70 in. above, and mean temp. 1°·2 above, the average of 22 years.

TIGHNABRUAICH.—An uncommonly wet month, embracing all the features—R, H, S, Sleet, T, etc.

ABERDEEN, CRANFORD.—The month was colder and less spring-like than January. The highest min. temp. being 40° on the 1st, 10th, and 14th. Wind W. and N.W., and often high.

S. RONALDSHAY, ROEBERRY.—A very wet cold month. The wettest February recorded in 31 years. Mean temp. 37°·8, or 0°·8 below the average.

IRELAND.

DARRYNANE ABBEY.—On the whole a mild month, but colder towards the end. Strong gale, with heavy squalls, on the 4th. S and sleet on 20th.

WATERFORD, BROOK LODGE.—H and S showers on 2nd. One of the heaviest gales this winter from N.W. on 4th. H on 20th, S on 21st. Large flocks of starlings seen on 15th.

O'BRIENSBRIDGE, ROSS.—Mild up to 20th, when S fell, followed by very rough and cold weather.

DUBLIN, FITZWILLIAM SQUARE.—Of average mean temp., this month was no less than 5° colder than January. It was a rainy month, for there were only 10 days on which there was no registerable rainfall; but the downpours were not heavy, except on 17th. Prevailing winds W. and N.W., and the force often considerable. On the whole the month was a fairly average February. Mean temp. 42°·9, or 0°·1 above the average. Foggy on 3 days. The amount of cloud, 5·0, is 1·6 below the average. High winds occurred on 18 days, reaching the force of a gale on 5. Solar halo on the 5th, lunar halos on 4th and 6th.

CLIFDEN, KYLEMORE.—A very wet and cold month throughout. Gales from N.W. on 3rd and 4th, and from S. on 7th, stormy on 1st, 5th, 8th, 10th, and 28th. H on 1st, 26th, and 27th.

OMAGH, EDENFEL.—February was raw, wet, and unsettled throughout, with frequent, but transitory falls of S, and spells of frost. The mean temp., although almost exactly the average, was 4°·1 lower than that of January, causing it to be felt with unusual severity.

No. CCCLXXXVII.]
VOL. XXXIII.

[PRICE FOURPENCE.
Or 4s. per annum post free.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE
The Climate of Paris	33
Results of Meteorological Observations at Camden Square for March for 40 years, 1858–97	37
REVIEWS:	
Observational Astronomy: a practical book for amateurs	38
Beiträge zur Geophysik. Zeitschrift für physikalische Erdkunde	38
The Dry Winter of 1897–98	39
The Australasian Society for the Advancement of Science	40
Black Rain	40
Floods and Storms in South Africa	41
Aurora	42
Royal Meteorological Society	43
Climatological Table for the British Empire, October, 1897	44
Supplementary Table of Rainfall, March, 1898	45
Rainfall and Temperature in March, 1898, at 50 Stations	46
Meteorological Notes on March, 1898	47

APRIL, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

[CCLXXXVII.] APRIL, 1898. [PRICE FOURPENCE, or 1s. per ann. post free.

THE CLIMATE OF PARIS.

WE have just received from M. Jaubert a book* which is we think the first of its class. It is not the epitome of the observations made at Montsouris or at any other individual station, nor is it designed chiefly for meteorologists, but rather for the general public and for such professional men as doctors, engineers and others, who from time to time require meteorological details respecting the climate of Paris. The observatory at Montsouris was not established until 1872, therefore M. Jaubert had necessarily to utilize the records obtained by MM. Becquerel, Belgrand, Lemoine, Renou, the various directors of the Observatoire National, and old writers like Mairan and Cotte; but apparently M. Jaubert not merely fully acknowledges his indebtedness to the respective authors, but throughout the work generally indicates the sources of each statement which he makes.

We have one fundamental objection to the book: the author has retained the old plan of beginning each year with the 1st of December of the previous one. How much longer will it be before all meteorologists obey the decision of the Vienna Congress!

We epitomise the principal statements, but all who are interested in the climate of Fair Lutetia should procure the work for themselves.

Accidental barometric variations.—A recording barometer if near the track of the centre of a whirlwind shows a sudden fall at the instant of its passage. There have been two such cases—one in, and one near, Paris. On September 10th, 1896, a whirlwind passed close to the Tour St. Jacques, and the barometer fell suddenly 0·236 in., and on June 18th, 1897, a similar occurrence at Asnières produced a fall of 0·374 in. At Little Rock, Arkansas, U.S.A., during the passage of a tornado on October 2nd, 1894, the fall was 0·354 in.

Mean monthly pressure at Sea Level.—This is given on the authority of M. Angot for the period 1846–90, as follows, the yearly mean being 30·005 in.:—

Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
29·982	29·957	29·977	30·024	30·024	30·014	30·032	29·975	29·998	30·065

*logie de la Région de Paris, par Joseph Jaubert, Chef du service et Météorologique de l'observatoire Municipal de Montsouris et r St. Jacques. Baudry & Co., Paris, 1898; 8vo, 120 pages.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 10s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXVII.] APRIL, 1898. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE CLIMATE OF PARIS.

WE have just received from M. Jaubert a book* which is we think the first of its class. It is not the epitome of the observations made at Montsouris or at any other individual station, nor is it designed chiefly for meteorologists, but rather for the general public and for such professional men as doctors, engineers and others, who from time to time require meteorological details respecting the climate of Paris. The observatory at Montsouris was not established until 1872, therefore M. Jaubert had necessarily to utilize the records obtained by MM. Becquerel, Belgrand, Lemoine, Renou, the various directors of the Observatoire National, and old writers like Mairan and Cotte; but apparently M. Jaubert not merely fully acknowledges his indebtedness to the respective authors, but throughout the work generally indicates the sources of each statement which he makes.

We have one fundamental objection to the book: the author has retained the old plan of beginning each year with the 1st of December of the previous one. How much longer will it be before all meteorologists obey the decision of the Vienna Congress?

We epitomise the principal statements, but all who are interested in the climate of Fair Lutetia should procure the work for themselves.

Accidental barometric variations.—A recording barometer if near the track of the centre of a whirlwind shows a sudden fall at the instant of its passage. There have been two such cases—one in, and one near, Paris. On September 10th, 1896, a whirlwind passed close to the Tour St. Jacques, and the barometer fell suddenly 0·236 in., and on June 18th, 1897, a similar occurrence at Asnières produced a fall of 0·374 in. At Little Rock, Arkansas, U.S.A., during the passage of a tornado on October 2nd, 1894, the fall was 0·354 in.

Mean monthly pressure at Sea Level.—This is given on the authority of M. Angot for the period 1846–90, as follows, the yearly mean being 30·005 in.:—

Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
30·053	29·982	29·982	29·937	29·977	30·024	30·024	30·014	30·032	29·975	29·998	30·065

* Climatologie de la Région de Paris, par Joseph Jaubert, Chef du service Physique et Météorologique de l'observatoire Municipal de Montsouris et annexe Tour St. Jacques. Baudry & Co., Paris, 1898; 8vo, 120 pages.

We have not been able to trace whence this table was copied, but evidently there is a mistake somewhere, for the mean of the monthly values is 762·13 mm. (30·005 in.), and the mean for the year is said to be 762·30 mm. (30·012 in.)

The extremes of the barometric pressure (which, by the bye, the author has not reduced to sea level, therefore we have done so approximately) have been :—

1821 ..... Feb. 6, 9 a.m..... ... 31·002 inches.
1821 ..... Dec. 24, 11.15 p.m. ... 28·314 ,,

Temperature.—The mean temperature at the National Observatory, which may be regarded as nearly that of central Paris, is 51°·3, but in the suburbs it is less, *e.g.*, Parc St. Maur 50°·0.

The lowest temperature recorded in the neighbourhood, probably the lowest for many years, was −17°·5 (−27°·5 C.) on December 19th, 1871, at Montargis, but on the same day it was only −12°·1 at Aubervillers, and −6°·7 at the Observatoire National. Temperatures below zero Fahrenheit have been recorded on other days, even as lately as December 2nd, 1879, on the indisputable authority of M. Renou, it was −14°·1 (−25°·6 C.) at Parc St. Maur; and on the same day −11°·0 at Montsouris.

The highest recorded shade temperature (in 1874 and again in 1881) was 101°·1.

Relative Humidity.—Winter average about 80%, spring and summer rather under 60%, yearly mean 68%.

Fogs.—These are rather frequent, about 40 in a year.—This is M. Jaubert's statement; we think that fogs have become much worse in Paris since coal has been largely used in the place of wood; but as M. Jaubert defines these 40 days as those "on which one cannot distinguish objects at a distance of a mile," we think that a Londoner would reject a considerable proportion of the 40. Paris now has fogs which everybody would admit to be good specimens, when it is impossible to work in the Bibliothéque National, when the steamers cease to run, and when at night the police hold burning torches at the crossings of the streets, but we think that the 40 days include some that are hardly entitled to be there.

Rainfall.—The mean yearly fall of rain may be taken as 22 inches, but the mean varies in different parts of the city and suburbs from 21 to 25 inches.

The following are striking instances of two consecutive wet months:—

1854 ..... June 7·69 in., and July 4·11 in. ..... Total in 2 months 11·80 in.
1896 ..... Sept. 5·87 and October 6·57 in. ..... ,, ,, ,, 12·44 ,,

M. Jaubert gives a table of heavy rain falling in short periods, from which we have compiled the following, which is arranged exactly like the corresponding ones in *British Rainfall*. We think that short heavy rains are more frequent in Paris than in London;

but as the following list includes records from several stations, it is not possible to speak positively. Two of these entries, marked with an *, exceed anything in the great Camden rain of June 23rd, 1878; but all the others have been exceeded, most of them repeatedly:—

Date.	Duration. hr.	min.	Amnt. in.	Rate per hour in.
1880, Sept. 8	0	5	·59	7·08*
1889, June 9	0	6	·35	3·50
1896, July 26	0	8	·94	7·05*
1891, Sept. 3	0	8	·81	6·07
1866, Aug. 2	0	11	·46	2·51
1867, Sept. 20	0	20	1·62	4·86
1860, July 16	0	20	1·50	4·50
1865, May 23	0	20	1·02	3·06
1881, Sept. 9	0	20	·98	2·94
1889, May 26	0	25	1·67	4·01
[1]1867, Sept. 20	0	30	2·21	4·42
1866, July 16	0	30	1·26	2·52
[2]1849, July 8	1	0	1·77	1·77
1860, July 16	1	0	1·69	1·69

([1]) Given as 20 minutes on p. 27 and as 30 minutes on p. 28.
([2]) Given as June on p. 27 and as July on p. 28.

Snow.—The total depth of snow in a year is generally between 2 and 5 inches, but occasionally it is much greater; in 1788-89 it was 2 ft. 2 in., and in 1879 1 ft. 4 in.

Thunderstorms.—There are about 30 thunderstorms in a year, mostly in summer, but with one or two in the winter every three or four years. Although buildings are damaged nearly every year, very few persons are killed.

Hail.—Very little hail falls in Paris, and the stones are seldom more than $\frac{3}{4}$ of an inch in diameter. There are only two records of very large hail; on July 13th, 1788, one stone picked up at the end of the Faubourg Saint Antoine weighed 60 grammes (about $2\frac{1}{4}$ oz., avoirdupois), and on July 31st, 1808, one was reported to have been found near Marly, which weighed about *une demi-livre* (about 9 oz., avoirdupois).

Whirlwinds.—M. Jaubert has given a very interesting chapter on this subject, with a list of instances from A.D. 1309 to 1897.

Wind.—Direction.—This section should be amplified in the next edition. M. Jaubert states that the prevalent direction is S.W., but that there is evidence that the direction is deflected by the presence of the city, the direction being different in the centre from that on the outskirts N. and S. We have never heard this suggestion before, and think that it should be fully investigated.

Velocity.—The mean velocity at Montsouris (on a mast about 40 ft. high) is 9 miles an hour. The following high velocities are reported:—

1860, Feb. 27th— 92 miles per hour	M. Hervé Mangon, on a mast similar to that at Montsouris.
1869, Dec. 14th—101 ,, ,, ,,	
1893, Dec. 20th— 99 ,, ,, ,,	Richard fan on Eiffel Tower.

On November 12th, 1894, the anemometer on the Eiffel Tower recorded 95 miles and then failed; on the same day the records

were :—Observatoire National, 64 miles; Montsouris, 60 miles; Tour St. Jacques, 71 miles; and Montmartre, 101 miles.

Cloud.—The yearly average amount is 6·0, the lowest mean monthly value is 5·3 in August and September, and the highest, 7·2 in December. We do not understand the entry on page 49—"Decembre, 1762 : néb. : 46," surely it must be 1862, for the notation of cloud on the scale of 0-10 was not adopted at the earlier date. Can anyone state when it was introduced?

Soil Temperature.—The author gives the mean temperatures determined by M. Becquerel at the Jardin des Plantes as under :—

	ft in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Depth	3 3	19 8	36 1	52 6	68 11	85 4	101 9	118 1
Mean Temp.	52°·3	53°·4	53°·6	53°·8	53°·8	54°·3	54°·2	54°·4

We do not understand these values; they are unlike any that we remember for any part of the world—there is more difference between 3 ft. 3 in. and 19 ft. 8 in. than in the subsequent 98 ft. 5 in., and if plotted they all (except the first) agree within 0°·2 with a line starting from the lowest depth and cutting the surface at 53°·2, whereas there is abundant evidence that the mean temperature of Paris is quite 2° lower than that.

M. Jaubert makes some statements respecting the depth of frozen soil, but does not mention how the observations were made. With reference to some articles in these pages on "Water-pipes and frost," we should very much like to know precisely the mode in which the following observations were made :—"Aux environs de Paris, le sol dénudé a été gelé en 1879 à 0 m ·80 et en février 1895 à 0 m ·65 et seulement 0 m ·53 sous un sol gazonné, mais dans les parties basses comme à Achères il a gelé à 0 m ·80." Were these facts ascertained by buried thermometers? or by frozen water-pipes? or by digging up the soil?

There are other sections on Magnetism, Aurora, the Seine, and on Phenological phenomena, but we have said enough to show that the book, though not immaculate, is both interesting and useful.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

MARCH.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 A.M. and 9 P.M.						Extremes at 9 A.M. and 9 P.M.				Mean of all Highest	Mean of all Lowest.
					Mean.	Highest Month.		Lowest Month.		Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·904	30·202 1874	29·574 1876	9 a.m. 9 p.m.	29·907 29·901	30·208 30·197	1874 1874	29·561 29·587	1876 1876	30·788 30·782	2nd, 1867 2nd, 1867	28·693 28·676	10th, 1876 9th, 1876	30·456 30·447	29·185 29·244
Shade Temp. Dry Bulb	41·6	45·9 1859	35·9 1883	9 a.m. 9 p.m.	41·8 41·3	46·7 45·7	1859 1896	36·1 35·6	1883 1883	57·9 57·2	24th, 1858 22nd, 1896	20·4 24·7	4th, 1890 2nd, 1890	52·2 51·4	31·3 31·7
Shade Temp. Max.	50·2	..	...	...	...	56·6	1893	44·9	'83, '92	70·1	24th, 1858	31·4	2nd, 1892	61·9	38·9
Shade Temp. Min.	35·5	...	...	...	...	39·9	'59, '96	30·4	1883	51·3	7th, 1881	15·6	4th, 1890	46·8	25·3
Shade Temp. Wet Bulb	39·5	43·4 1896	34·1 1883	9 a.m. 9 p.m.	39·6 39·3	43·8 43·5	1859 1896	34·2 33·9	1883 1883	53·0 57·0	24, '58 & 29, '72 22nd, 1896	19·2 24·0	4th, 1890 2nd, 1890	49·4 49·1	29·9 30·0
Solar Rad., black	81·3	...	...	...	...	91·4	1882	70·6	1888	128·7	20th, 1882	36·4	2nd, 1875	104·3	48·8
Solar Rad., bright	58·2	...	...	...	...	64·6	1893	52·1	1888	78·4	31st, 1894	33·2	2nd, 1892	72·3	41·9
Grass Minimum	31·6	...	...	...	...	35·4	1862	27·8	1883	48·4	2, '70 & 7, '81	12·8	4th, 1890	44·0	21·0
Soil, 1 foot	40·7	...	...	...	...	44·3	1872	37·0	1886	48·0	31st, 1874	32·4	1st, 1895	44·7	36·8
Cloud	6·1	8·2 1888	3·1 1893	9 a.m. 9 p.m.	6·4 5·8	8·9 8·3	1862 1888	3·6 2·6	1893 1893	10 10	Every year Every year	0 0	Various Various	10·0 10·0	0·4 0·1
Rainfall	1·71	3·69 1862	·32 1893	9 a.m. 9 p.m.	·94 ·77	2·09 1·84	1862 1876	·11 ·11	1893 1874	·95 ·73	4th, 1870 12th, 1876	·00 ·00	Every year Every year	·33 ·25	·00 ·00

Max. Rainfall in 24 hours, ·95 in., 3rd, 1870. Mean max. daily fall, ·43 in.

REVIEWS.

Observational Astronomy: a practical book for amateurs. By ARTHUR MEE, F.R.A.S. Second and thoroughly revised edition, with numerous portraits, maps, and illustrations. "Western Mail," Cardiff and London. 1897. 4to, viii.–113–vi. pp.

THE boundary line between astronomy and meteorology is, in many parts of it, not clearly defined,—take for instance sunspots and aurora, sunspots and weather, or meteors, or solar eclipses, who can define the limits of the two sciences?

There is, therefore, every justification for our offering a few words of welcome and encouragement to the editor of this good and cheap book. It is an astronomical book which will charm non-mathematical readers, for we do not think that it contains a single mathematical expression, and, *per contra*, there must be nearly 200 engravings, some beautiful, mostly good, and only a few of the portraits bad. Some of the little portraits are extremely good, *e.g.*, Flammarion, on p. 72, and the larger one of J. C. Adams, on p. 79; but they are unequal, for instance, on pp. 80 and 81, we have Sir W. Huggins and M. Janssen, not very life-like, and Sir Norman Lockyer, as nearly perfect as any woodcut could be. On p. 81, is the only misprint which we have noticed, "Foye," for "Faye." It is a thoroughly useful book.

Beiträge zur Geophysik. Zeitschrift für physikalische Erdkunde. Herausgegeben von Prof. Dr. GEORG GERLAND Band III. Heft 1 and 2. 8vo. W. Engelmann, Leipzig, 1896–97, 336 pages, and 5 plates.

ALTHOUGH containing other papers, these two numbers may in some sort be regarded as an obituary notice of a very able man, Dr. Ernest L. A. v. Rebeur-Paschwitz, who in a comparatively short life (August 9, 1861—October 1, 1895), and in spite of much ill health, rendered good service both to astronomy and to terrestrial physics. Dr. Gerland gives a list of twenty-nine papers written by Rebeur-Paschwitz in the last twelve years of his life, but to our own knowledge the list might be considerably extended, because—*e.g.*, there is no reference to his work in connection with the Krakatoa twilight phenomena.

Although not the first to employ horizontal pendulums, we think that their present use in observing and recording minute movements in the crust of the earth is almost entirely due to the labours of Dr. v. Rebeur-Paschwitz, and Prof. John Milne, who is now organising a system of records with horizontal pendulums of identical construction in all quarters of the world.

When illness compelled Dr. v. Rebeur-Paschwitz to visit Teneriffe, he took his instruments with him and made observations for comparison with those made at Potsdam and at Wilhelmshaven.

Afterwards his pendulum was placed in the basement of Strasburg observatory, and in Part I. of the work under notice, Herr Reinhold Ehlert gives a full record and analysis of the observations.

Another noteworthy paper in these Journals is that by Dr. Boller, of Strasburg, upon the Aurora Australis. It is by far the best memoir upon the subject which we have seen; it occupies 74 pages, and when we add that not only has Dr. Neumayer allowed the author the use of the library of the Seewarte at Hamburg, but also helped him in every way, and given him the use of his own MS. records, all will realise that the author's opportunities were special, and we think that we may add that he has made very good use of them. We see that the paper is described as "First Part." Perhaps in the second part the author will do that which through his work is now possible—it has long been desirable—namely, to bring together the dates of manifestation of auroral activity around the Northern and around the Southern Pole, and to study the phenomena as a whole.

THE DRY WINTER OF 1897–98.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall of March having been slightly above the average, we may, perhaps, consider the dry period—which began in October last—as having come to an end. The following table will show its very exceptional character :—

1853-4.		1884.		1893.		1895.		1897-8.		Mean of 40 years.	
	in.		in.		in.		in.		in.		in.
Dec.	·66	Feb.	1·05	Mar.	·22	Feb.	·22	Oct.	·61	Oct.	2·69
Jan.	1·55	Mar.	1·14	Apr.	·09	Mar.	1·30	Nov.	1·16	Nov.	2·27
Feb.	·97	Apl.	·87	May	·90	Apl.	1·02	Dec.	1·53	Dec.	1·96
Mar.	·30	May	·56	June	·54	May	·69	Jan.	·80	Jan.	2·02
Apl.	·50	June	·83	July	2·38	June	1·26	Feb.	·66	Feb.	1·52
Total	3·98		4·45		4·13		4·49		4·76		10·46

These are all the instances of five consecutive months with less than 5 in. of rain since observations began here in 1851. Three of them, as might have been expected, include the spring or early summer—only one (1853-4) including the winter months; so that I think it may safely be said that we have not had an autumn and winter so dry as the last for 44 years.—I remain, yours very truly,

HENRY S. TABOR, F.R.Met.Soc.

Fennes, Braintree, April 7th, 1898.

[The above sets out the facts so clearly that we insert it at once. We have been favoured with much interesting information, which we hope to be able to arrange and insert next month.—ED.]

THE AUSTRALASIAN SOCIETY FOR THE ADVANCEMENT OF SCIENCE.

(*Concluded from p. 27.*)

Red Rain.

In a paper by Mr. Thomas Steel, F.L.S., F.C.S., on "Red Rain Dust" some interesting details were given of an analysis of a very clean sample of the dust, which was collected by Mr. W. E. Appleby, who was a resident of Moonee Ponds towards the end of 1896, when there was a very heavy fall of dust of a red colour over Melbourne and a considerable area of Victoria. The sample was dried at 110° C., and was found to contain the following :—

Organic matter	10·70
Sand, insoluble and undetermined	66·21
Soluble silica	·75
Ferric oxide	4·68
Ferrous oxide	·50
Alumina	15·16
Lime	1·36
Sulphuric anhydride	·62
	99·98

The above may be regarded as a characteristic example of ordinary surface soil, such as is derived from the weathering of volcanic rocks. Both in appearance and composition it agreed closely with several samples of such soil from widely separate localities. Under the microscope, in addition to the diatoms noticed by other observers, the dust was seen to contain a few lepidopterous scales.

BLACK RAIN.

To the Editor of the Irish Times.

Sir,—The area of the fall of black rain on last Wednesday extended over a surface of country about thirty miles in length, and at least sixteen in width; while the black was falling it was so dark that the lamps had to be lit in many of the shops and houses of this town. This and the area of rainfall will give some idea of the enormous quantity of foreign matter suspended in the black clouds, which slowly travelled in a north-easterly direction. The colouring matter was soot, and the presence of so enormous a quantity of soot in a country so far removed from large manufacturing towns can only be accounted for, at least in my opinion, by the following facts. For the previous week there had blown strong winds from the north-east, while the weather was very dry, with a high barometer. These breezes had evidently collected the soot from over the manufacturing towns of North England and South Scotland, and carried it at a very high altitude in a south-westerly direction, causing lovely sunsets very similar to those which followed the eruption of Krakatoa while the volcanic dust remained suspended in the lofty clouds. The soot-laden clouds travelled on till they met

a moisture-laden wind from the south-west, which began to blow on the evening of Tuesday. The soot evidently got perfectly mixed with the moisture in these clouds, and travelled slowly back again towards the N.E., getting gradually nearer and nearer to the earth, till at last it fell in black rain in this neighbourhood. The soot was thoroughly mixed with the rain and did not fall as smuts do in London after a pea-soup November fog. While the black rain was falling, birds went to roost, and many persons were greatly alarmed at the intense darkness, as no eclipse was expected, and they could not account for the strange phenomenon.—Yours, &c.,

JOHN RINGWOOD.

Kells, Co. Meath, 31st March, 1898.

[We are indebted for the above to our correspondent at Belvedere, Mullingar, who himself reported for "March 30th ·11 Black rain." —ED.]

FLOODS AND STORMS IN SOUTH AFRICA.

The *Cape Times* of February 2nd (for the copy of which we are indebted to an unknown correspondent) reports "Unprecedented Rainfall," "Houses Wrecked," "Roofs Blown Three Miles," "Many Lives Lost."

We will try to epitomise the information upon which these alarming head lines are based.

"*Unprecedented Rainfall.*"—There are very few figures given; we read that "at Johannesburg the rainfall of January 28th was reported by different observers as between 2 and 3 inches." "At Bloemfontein the rainfall up to January 27th is 10·75 inches, being the greatest for any month during the previous 18 years; previously the greatest was 9·98 inches in March, 1880." From Aliwal North the report on January 27th was "Heavy Rain, ten inches of rain have fallen in a week, and 12 inches during January."

"*Flood Levels.*"—Prieska, "A tremendous flood occurred here on the afternoon of January 29th. The Orange river grew to be two miles in width and encroached rapidly on the town, sixteen houses have been washed away, and the volume of water exceeds that in the great flood of 1881." Aliwal North, "The Orange river is in high flood, and the water is almost lapping the stone which marks the highest level of 1874."

"*Houses Wrecked,*" "*Roofs blown Three Miles.*"—Wreckage seems to have occurred not merely at Prieska (as stated above), but more severely during a violent gale and hailstorm which passed over Vosburg, near Britstown, on the night of January 23rd. "Thirty-two houses were damaged, and most of them were completely wrecked. At the location every hut and building was swept away. Some roofs are lying three miles away from the village."

AURORA.

WE place two or three notes under this general heading, because some refer to the manifestations around the Southern, some to those around the Northern, Pole.

Reference to Aurora Australis will be found among the "Reviews" on page 39. We have just received from Mr. H. C. Russell, C.M.G., F.R.S., a short paper on the Aurora Australis of April 20th, 1897, as seen from Lat. 47° S. and Lon. 97° E.

In *Nature* of March 24th, Dr. Chree gives particulars of the disturbance of the magnetometers at Kew Observatory, which began at 8.55 p.m. on March 14th, 1898, and did not cease until 5 p.m. on the 16th. Dr. Chree describes it as by far the greatest since August, 1894.

On the evening of March 15th, there was a magnificent Aurora Borealis. The following description of the display, as observed from Wishaw, Lanarkshire, is the best that we have seen:—

AURORAL PHENOMENA.

(*Notes by the* REV. ALEXANDER HARPER, M.A., *Wishaw Manse.*)

On Tuesday evening there was a succession of heavy showers, and the sky was often much overcast by cloud. It was about a quarter to 10 o'clock that I observed a notable brightness towards the north, and a rush upwards of a red streamer gave unmistakeable indications of an auroral display. There followed a partial clearing away of the clouds, and the colours of the dancers near the horizon became more vivid, and the luminosity, though irregular, was moving upwards. From 10.30 to 11 p.m. occurred the climax of a display such as I never before witnessed, not even in the November occurrence about 25 years ago, when the spectacle was beheld not only in the Northern hemisphere but in Australia. There stretched overhead across the whole canopy of heaven, as from two emanating sources, one S.W. by West, the other N.E. by North, six to eight parallel belts of parti-coloured light, each somewhat narrower than the ordinary rainbow, but distinctly separate, and each had its rushing transient gleam of light shooting through it; and though the belts appeared to break up and re-form, the successive distinctness remained and gave the idea of rotundity. But the most remarkable phenomenon was the slower rolling across these belts and at right angles, of what seemed like successive waves of white light, which not only heaved across the belts but moved occasionally to within not less than 35 degrees of the southern horizon. From half-past 10 to nearly 11 o'clock the strange appearances continued, and simultaneously with their partial breaking up there was formed in the north-east what seemed a great drapery of light, with a magnificently luminous fringe, which appeared to hang in folds and extend from about 20 degrees west of, and a little below, the pole star down to the seat of emanations in the east. This spectacle remained, however, but a few minutes, and then there followed a succession of radial circles each around a non-luminous centre, and as these broke up there was a series of flashing coruscations in cycloidal waves here, there, and everywhere overhead, like a distant display of bursting rockets. This continued for another twenty minutes. By 12 o'clock the dancers cutting impressive capers heeled away to their native north, and at 1 o'clock were still shooting out lurid gleams from the horizon, and shedding a light equal to about that of the moon in the first

quarter. Such gorgeous phenomena are hardly to be witnessed in a lifetime in our latitude, and he would be a dull soul who could ever forget the impressive grandeur. One could realise after such a spectacle what Nansen said regarding the brilliancy of the Auroræ in the Polar regions.

ROYAL METEOROLOGICAL SOCIETY.

AT the meeting of this Society held on Wednesday evening, March 16th, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair, the following new Fellows were elected:—Robert Gray, M.R.A.C.; Will. R. Griffith; James E. Prichard, B.A., M.B. Oxon; F. P. Pullar, F.R.G.S.; William Harold Tingey, B.A.

Subsequently, a lecture on "*Photographing Meteorological Phenomena*" was delivered by Mr. A. W. Clayden, M.A., Principal of the new College at Exeter, who gave details of his experiences as Secretary of the Committee of the British Association on Meteorological Photography. After referring to the extreme value of photographic methods of recording the movements of instruments, the lecturer spoke of the real importance of preserving photographic records of all sorts of unusual meteorological phenomena; and as regards floods, emphasized the necessity of companion photographs, showing the same scene under normal conditions. It was suggested that meteorologists throughout the country should co-operate with the Royal Meteorological Society in securing such records. The phenomena of the lightning discharge, as distinguished from those of a singl e flash, were next described and illustrated by a number of lantern slides. Some of the puzzles offered by lightning photographs were next alluded to; the lecturer stated that he had repeatedly found that a single discharge lasted several seconds. Mr. Clayden then spoke of the "black" flashes shown in photographs, and described the steps by which, some years ago, he was led to the proof that they were merely a photographic phenomenon, but one which still remains unexplained. Passing on to a consideration of cloud photography, the various methods in use were explained, and a large number of lantern slides were exhibited, in some of which the clouds were shown on a background of blue sky in nearly their natural colours, a new result obtained by the employment of suitable developers on a specially prepared plate. The method employed at Exeter by the lecturer for the measurement of cloud altitudes was fully described. This differs from all other methods in using the sun as a reference point. Mr. Clayden then spoke of the difficulty in getting good pictures of cirrus clouds, and described the methods dependent on the polarization of the blue light of the sky; but expressed a conviction that polarization had nothing to do with their efficiency, which was really due to a general lessening of brightness which enabled the exposure to be properly judged.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	67·2	17	31·9	7	58·4	44·3	45·4	83	106·9	29·8	·56	9	5·8
Malta	84·2	23	53·3	13	72·3	62·0	57·1	75	151·1	47·7	2·87	9	5·2
Cape of Good Hope	80·9	8	42·1	3	67·8	53·6	53·0	76	...	...	1·89	8	4·9
Mauritius	82·8	27	59·1	20	78·5	65·5	62·0	74	131·3	50·9	1·40	16	6·4
Calcutta	89·3	11	63·4	27	85·8	75·1	73·8	80	154·2	57·1	8·61	10	5·8
Bombay	89·6	28	72·8	20	87·4	76·7	74·7	78	142·0	62·1	2·51	7	3·7
Ceylon, Colombo	90·7	25	73·3	...	87·8	77·1	73·6	79	148·0	70·0	4·71	16	5·2
Melbourne	80·2	27	38·3	4	65·4	47·0	45·1	69	133·6	27·9	1·77	11	6·4
Adelaide	90·7	27	41·0	9	70·4	50·5	45·1	59	145·8	30·2	·51	13	4·6
Sydney	87·9	25	47·3	12	72·4	55·0	49·0	60	147·3	39·2	1·36	11	4·2
Wellington	65·0	22	38·0	28	59·2	47·8	44·7	70	128·0	27·0	5·51	18	4·6
Auckland	66·0	20	45·0	19	61·9	49·7	46·0	69	129·0	41·0	3·63	22	6·0
Jamaica, Kingston	90·9	7	70·3	24	85·4	72·2	72·0	87	...	...	23·45	16	5·7
Trinidad	91·0	*a*	68·0	2	88·9	71·6	73·8	83	169·6	67·0	8·87	16	...
Grenada	89·4	21	71·2	22	84·6	75·9	73·9	73	154·2	...	5·23	16	2·1
Toronto	85·7	15	27·6	30	59·1	41·7	43·1	76	102·0	21·5	1·45	9	5·7
New Brunswick, Fredericton	72·8	5	19·8	31	57·8	32·6	31·3	57	...	...	·62	3	3·4
Manitoba, Winnipeg	84·8	2	14·8	9	55·2	34·0	...	...	...	...	1·33	11	6·0
British Columbia, Esquimalt	65·0	5	33·5	14	55·2	42·3	46·0	94	...	...	1·26	15	6·4

a—Various.

REMARKS.

MALTA.—Adopted mean temp. 66°·7, or 2°·7 below the average. Mean hourly velocity of wind 10·8 miles. Mean temp. of sea 67°·0, or 2°·5 below the average. T8S on 3rd and 6th; L on 9 days; H on 6th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3 below, of dew point 0°·2 above, and rainfall ·22 in. below, their respective averages. Mean hourly velocity of wind 10·6 miles, or 0·6 below average; extremes, 28·2 on 1st and 1·7 on 16th. Prevailing direction E. by S. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·2 or 2°·2 above, of dew point 73°·6 or 0°·7 above, and rainfall 4·71 in. or 10·01 in. below, their respective averages. Mean hourly velocity of wind 8·4 miles; prevailing directions W. and W.S.W. T8S on 4 days; L on 2 days. H. O. BARNARD.

Adelaide.—Mean temp. 1°·6 below, and rainfall 1·31 in. below, the average for 40 years. C. TODD, F.R.S.

Sydney.—Temp. 0°·2 above, humidity 8·9 below, and rainfall 1·46 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery weather, except in the middle, when it was fine, but with strong N.W. wind. Prevailing wind N.W., frequently stormy. T on 27th and 28th; H on 27th. Rainfall 1·14 in. above, and mean temp. 0°·1 below, the average. Earthquakes on 14th and 18th. R. B. GORE.

Auckland.—Cold, showery and unsettled throughout. Mean temp. much below, and rainfall slightly below, the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 1·4 miles. Rainfall three times the average. Island rainfall more than twice the average. Very heavy "seasons," making the fall the third highest monthly fall in 27 years. The drought of the first few months of 1897 is now counterbalanced, and the total for the year is *over the average.* R. JOHNSTONE.

TRINIDAD.—Rainfall 2·20 in. above the 30 years' average. J. H. HARE.

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·85	XI.	Builth, Abergwesyn Vic.	2·85
II.	Dorking, Abinger Hall .	1·65	,,	Rhayader, Nantgwillt ...	2·47
,,	Birchington, Thor	1·95	,,	Lake Vyrnwy	1·71
,,	Hailsham	1·57	,,	Corwen, Rhug	1·35
,,	Ryde, Thornbrough	·48	,,	Criccieth, Talarvor	1·24
,,	Emsworth, Redlands ...	·81	,,	I. of Man, Douglas	1·97
,,	Alton, Ashdell	·89	XII.	Stoneykirk, Ardwell Ho.	1·16
III.	Oxford, Magdalen Col..	·74	,,	New Galloway, Glenlee	2·06
,,	Banbury, Bloxham	·50	,,	Moniaive, Maxwelton Ho.	1·18
,,	Northampton, Sedgebrook	1·12	,,	Lilliesleaf, Riddell	1·23
,,	Duddington [Stamford].	1·38	XIII.	N. Esk Res. [Penicuick]	2·40
,,	Alconbury	1·15	XIV.	Glasgow, Queen's Park..	1·65
,,	Wisbech, Bank House...	1·43	XV.	Inverary, Newtown	4·44
IV.	Southend	2·09	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	1·51	,,	Islay, Gruinart School ...	1·35
,,	Colchester, Lexden	1·48	XVI.	Dollar.....	1·84
,,	Rendlesham Hall	2·02	,,	Balquhidder, Stronvar...	3·25
,,	Rushall Vicarage	2·07	,,	Ballinluig	...
,,	Swaffham	1·92	,,	Dalnaspidal H.R.S.....	3·44
V.	Salisbury, Alderbury ...	·69	XVII.	Keith H.R.S.....	3·16
,,	Bishop's Cannings	·81	,,	Forres H.R.S.	2·17
,,	Blandford, Whatcombe .	1·12	XVIII.	Fearn, Lower Pitkerrie..	1·44
,,	Ashburton, Holne Vic...	2·60	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	2·37	,,	Invergarry.....	3·82
,,	Hartland Abbey	1·22	,,	Aviemore H.R.S.	2·05
,,	Lynton, Glenthorne ...	1·48	,,	Loch Ness, Drumnadrochit	2·53
,,	Probus, Lamellyn	1·79	XIX.	Invershin	3·14
,,	Wellington, The Avenue	1·00	,,	Durness.....	6·75
,,	North Cadbury Rectory	1·10	,,	Watten H.R.S.....	2·35
VI.	Clifton, Pembroke Road	·95	XX.	Dunmanway, Coolkelure	1·75
,,	Ross, The Graig	·60	,,	Cork, Wellesley Terrace	·56
,,	Wem, Clive Vicarage ...	·65	,,	Killarney, Woodlawn ...	1·44
,,	Wolverhampton, Tettenhall	·87	,,	Caher, Duneske	·85
,,	Cheadle, The Heath Ho.	1·19	,,	Ballingarry, Hazelfort...	·86
,,	Coventry, Priory Row ..	·97	,,	Limerick, Kilcornan ...	...
VII.	Grantham, Stainby	1·18	,,	Broadford, Hurdlestown	·80
,,	Horncastle, Bucknall ...	1·47	,,	Miltown Malbay	1·75
,,	Worksop, Hodsck Priory	1·49	XXI.	Gorey, Courtown House	1·10
VIII.	Neston, Hinderton	·59	,,	Athlone, Twyford	1·26
,,	Southport, Hesketh Park	·91	,,	Mullingar, Belvedere ...	·91
,,	Chatburn, Middlewood.	2·56	,,	Longford, Currygrane...	·45
IX.	Melmerby, Baldersby ...	1·35	XXII.	Woodlawn	1·33
,,	Scarborough, Observat'y	1·51	,,	Crossmolina, Enniscoe ..	2·60
,,	Middleton, Mickleton ...	1·19	,,	Collooney, Markree Obs.	2·34
X.	Haltwhistle, Unthank...	1·51	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	1·21	XXIII.	Warrenpoint.....	1·13
,,	Duddon Valley, Ulpha School	2·74	,,	Seaforde.....	·96
,,	Keswick, The Bank	1·68	,,	Belfast, Springfield	1·68
XI.	Llanfrechfa Grange	1·11	,,	Bushmills, Dundarave..	1·52
,,	Llandovery	2·30	,,	Stewartstown	1·04
,,	Castle Malgwyn	1·54	,,	Killybegs	3·08
,,	*Brecknock, The Barracks*	·55	,,	Horn Head	2·22

MARCH, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·46	— ·15	·32	3	10	59·1	18	25·1	13	11	24
II.		Tenterden	2·31	...	·75	24	14	63·5	18	26·5	6, 13	11	26
,,		Hartley Wintney	1·04	...	·37	26	14	62·0	18	16·0	21	26	26
III.		Hitchin	1·27	— ·07	·40	26	14	56·0	18	24·0	6, 7	22	...
,,		Winslow (Addington)	1·09	— ·63	·30	26	16	59·0	18	22·0	21	18	24
IV.		Bury St. Edmunds (Westley)	2·11	+ ·56	·52	26	13	58·0	19	20·0	7	21	...
,,		Norwich (Brundall)	2·18	...	·70	26	16	63·4	18	22·8	6	14	26
V.		Winterbourne Steepleton ...	1·63	...	·42	6	16	55·8	18	25·1	21	18	28
,,		Torquay (Cary Green)	1·87	...	·80	6	12	56·1	16	29·6	25	5	22
,,		Polapit Tamar [Launceston]..	1·20	— 1·33	·26	5	13	54·7	19	24·3	12	17	27
VI.		Stroud (Upfield)	·62	— 1·57	·16	19	12	55·0	18	26·0	9	20	...
,,		ChurchStretton(Woolstaston)	·68	— 1·45	·17	1	17	57·5	17	25·0	25	21	26
,,		Worcester (Diglis Lock)	·37	— 1·41	·19	19	9	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	·93	...	·30	26	16	58·0	19	19·0	10	20	26
,,		Boston	1·37	— ·17	·50	26	14	60·0	18	22·0	9	19	...
,,		Hesley Hall [Tickhill].....	·95	— ·95	·25	26	12	60·0	18	21·0	6	19	...
VIII.		Manchester(PlymouthGrove)	1·26	— ·96	·30	17	12	55·0	17	24·0	8	15	17
IX.		Wetherby (Ribston Hall) ...	1·04	— 1·02	·20	28	8	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·35	— ·75	·95	15	15	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·34	— ·71	·31	26	16	58·0	18	25·0	7	18	22
X.		Newcastle (Town Moor)	1·40	— 1·23	·46	26	10	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	6·47	— 4·03	1·91	15	17	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·55	— 1·43	·60	6	14	...	...	...	...	...	...
,,		Haverfordwest	1·24	— 2·00	·25	28	14	53·5	17	25·5	30	15	26
,,		Aberystwith (Gogerddan) ...	1·51	— 1·47	·27	6	11	53·0	31	...	...	...	...
,,		Llandudno.....	1·05	— 1·03	·42	18	12	56·0	17	29·5	8	3	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·04	— 2·26	·24	15	10	55·2	18	22·6	8	14	...
XIII.		Edinburgh (Blacket Place)...	1·22	...	·50	27	15	56·0	11	27·0	8	10	19
XIV.		Colmonell	1·40	...	·22	13	12	58·0	24	27·0	8	...	...
XV.		Tighnabruaich	3·19	...	·47	19	18	...	...	...	...	10	...
,,		Mull (Quinish).....	3·28	— ·56	·41	5	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices.....	1·40	— 1·57	·20	19*a*	10	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·45	— 1·95	·15	27	14	61·0	17	24·1	8	16	...
XVII.		Braemar	1·67	— ·97	·34	1	19	53·7	18	8·5	8	23	29
,,		Aberdeen (Cranford)	2·27	...	·38	2	18	61·0	17	25·0	7	17	...
,,		Cawdor (Budgate)	2·38	+ ·34	·57	28	21	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·97	+ ·65	·62	12	15	...	...	...	...	...	...
,,		Glencarron Lodge.....	10·45	...	2·02	16	25	48·9	18	20·9	8	15	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	4·56	+ 2·02	1·18	17	24	50·0	11*b*	27·0	4	13	...
XX.	IRELAND.	Darrynane Abbey.....	1·51	...	·52	5	13	...	...	...	...	...	...
,,		Waterford (Brook Lodge)	·42	— 2·48	·16	18	7	60·0	17	24·0	22	14	...
,,		O'Briensbridge (Ross)	1·04	...	·41	18	8	..	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·17	— 1·20	·24	18	14	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·04	— ·97	·23	27	16	59·3	18	30·8	5	5	...
XXII.		Ballinasloe	...	...	...	...	...	...	...	...	...	...	...
,,		Clifden (Kylemore)	2·90	...	·57	18	16	...	...	...	...	...	...
XXIII		Waringstown	·99	— 1·36	·18	18	11	58·0	16	22·0	7	18	...
,,		Londonderry (Creggan Res.).	2·26	— ·47	·39	1	26	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·64	— ·87	·27	18	15	54·0	17*c*	25·0	7	12	29

+ Shows that the fall was above the average; — that it was below it.

a—and 28, 29, 30. *b*—and 17. *c*—and 18, 23.

METEOROLOGICAL NOTES ON MARCH, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

HARTLEY WINTNEY.—A seasonable month. Ushered in by storms from the N.E., a spell of remarkably fine weather followed, from 13th to 23rd. The most wintry period of the year occurred from 24th to 27th. Rainfall ·68 in. below the average. Ozone registered on 26 days.

ADDINGTON.—R was measured on a good many days, but in small quantities. The temp. fell to 22° on 21st and to 25° on 10th, 22nd and 23rd. Strong gales blew on 24th, 25th and 26th, with showers of snow, which formed great wreaths by the side of hedges.

BURY ST. EDMUNDS, WESTLEY.—The most winterly month of the year. S storms set in on 23rd and continued for 5 days, with much drifting. The snow-plough was used on the roads on 25th.

NORWICH, BRUNDALL.—A colder March than in any year since 1892. Very dry till 22nd, followed by a gale from N.E., almost continuous for nearly 72 hours, with heavy S, sleet and driving R. H on 1st and 7th; S on 7 days; L on 2nd.

WINTERBOURNE STEEPLETON.—With the exception of ·64 in. of R which fell on the 5th and 6th, and ·43 in. which fell in nearly the last 24 hours of the month, there was only ·56 in. spread over the remainder. The temp. was low, the daily mean being only 39°·5, or 4°·0 below the average of 5 years, whereas in January and February it was respectively 44°·1 and 41°·0. The weather was stormy, with very cold wind both at the beginning and end of the month. The relative humidity was low, the mean percentage at 9 a.m. being only 81.

TORQUAY, CARY GREEN.—Rainfall ·71 in. below the average of 22 years. Mean temp. 1°·9 below the average. Duration of sunshine 132 hours 40 mins., being 11 hours 45 mins. below the average; four sunless days.

POLAPIT TAMAR.—A cold and dry month; stormy at the beginning and towards the end, and practically the only real approach to winter weather for the season. H on 3 days; S on 4 days; fog on 23rd.

STROUD, UPFIELD.—S showers on 24th and 25th; N.E. gales on 25th and 26th.

WOOLSTASTON.—A cold and very dry month. S fell lightly on 3rd and 5th, and there were only 5 nights without sharp frost on the ground. A bitterly cold gale, with violent scuds of S, raged from 24th to 26th. Mean temp. 39°·0.

BOSTON.—With the exception of September, the monthly rainfall since August has been much below the average, the total for the seven months being 4·90 in. below the average of 40 years. The reservoir of the Boston Water Works at Miningsby at the end of March was deficient of its full supply 11½ inches. This has never happened previously since the reservoir was constructed about 50 years ago.

WALES.

HAVERFORDWEST.—March commenced with a fresh gale from N.W., the air cold and bleak. Sharp frosts commenced on 3rd, and continued more or less severe up to 15th. After this, broken weather with cold R to the 19th; followed by severe frost with bitter wind to the end of the month. S covered the Precelly range from 6th to 8th. An exceptionally stormy period set in on 24th, very strong gales from the N.E., doing considerable damage; in Fishguard Bay five vessels were wrecked, but the crews were all saved. This storm lasted with unbated violence until 26th. Another heavy S storm covered the Precelly range on 29th. The coldest March since 1891. Vegetation received a

salutary check. The min. on grass fell below 20° on 15 nights, and on 8 of them to between 10°·5 and 15°·0.

ABERYSTWITH, GOGERDDAN.—Strong gale, with S and sleet from N.E., from 24th to 27th.

SCOTLAND.

CARGEN [DUMFRIES].—Except for an interval of mild weather from 17th to 19th, when the mean temp. was 49°·4, the month was exceptionally cold; the mean temp. having been lower in March only 13 times since 1860. A sharp "nip" occurred during the last 8 days, when the mean was only 37°·4. A stiff breeze blew from E. or N.E. during the whole of this period, and more bitter weather has seldom been felt in this district. The lowest temp. of the winter was 22°·6 on 8th, and the mean minimum temp., 32°·6, is without parallel in March. The rainfall is the lowest recorded in 39 years, with the exception of 1869 and 1892, when ·86 in. and 1·03 in. were registered respectively. The rainfall for the first quarter of the year is 1·65 in. below the average. There were 26 hours of sunshine more than the average. E. and N.E. winds prevailed on 22 days, a gale from N.E. occurring on 24th. One of the most beautiful auroræ ever seen in the district was visible on the night of 15th. The low temp. and cold winds caused a very decided check to vegetation, and the promise of an early spring has been far from realized.

EDINBURGH, BLACKET PLACE.—Mean temp. 0°·6 above, and rainfall ·76 in. below, the mean. S on 7 days; H on 2 days; fog on 7th; brilliant aurora on 15th; N.E. gale on 24th.

COLMONELL.—R 2·06 in. below, and temp. 1°·2 above, the average of 22 years. S on 3 days; T and L on 1st.

TIGHNABRUAICH.—A model spring month. Compared with March, 1897, the rainfall is 2·92 in. less; the mean max. temp. 0°·9 and the mean min. 1°·8 lower. On 20th began the N. and N.E. winds, drying the soil for sowing time.

ABERDEEN, CRANFORD.—A very cold month, with high winds.

S. RONALDSHAY, ROEBERRY.—A very wet, cold month; mean temp. 38°·5, or 1°·1 below the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—A very dry month; no R after 18th, being 13 days; so many without any rain have not occurred since the beginning of October, 1894. The last part very cold, with frost at night.

WATERFORD, BROOK LODGE.—Much easterly wind during the month. Rainfall very small. S on 5th, 25th and 26th; H on 4th.

DUBLIN, FITZWILLIAM SQUARE.—March proved the coldest month of the winter. A warm spell occurred from 15th to 19th, but from 23rd very cold weather held to the end of the month. Mean temp. 42°·7, or 0°·4 below the average. Fog on 5 days; N.E. gale on 24th and 25th; S or sleet on 9 days, and H on 8 days. Solar halo on 22nd; lunar halos on 1st and 3rd; brilliant aurora on the evening of 15th.

WARINGSTOWN.—A dry month. Very cold N. and N.E. winds in the last fortnight.

OMAGH, EDENFEL.—The weather of March justified its well-known character; the mean temp. was somewhat, and the rainfall considerably, below average. Polar winds blew on 18 days, and in the earlier part of the month were accompanied by S, sleet and R; but the fierce N.E. gales of the last 10 days, which were accompanied by S blizzards in England and Scotland, were here both moderate and dry and generally clear, resulting in the most favourable seed-time for many years. The mean temp. of the month was 3°·3 lower than that of January.

No. CCCLXXXVIII.]
VOL. XXXIII.

[PRICE FOURPENCE.
Or 4s. per annum post free.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
The Climate of Algeria	49
Results of Meteorological Observations at Camden Square for April for 40 years, 1858–97...	52
The Dry Winter	53
The Gloomy Summers of 1860 and 1879, and the 19 Years' Cycle...	57
REVIEWS:	
Ueber das Wetterschiessen am südöstlichen Abhange des Bachergebirges nächst Windisch-Feistritz (Steiermark) ...	58
Blue Hill Meteorological Observatory	58
Royal Meteorological Society	59
Climatological Table for the British Empire, November, 1897 ...	60
Supplementary Table of Rainfall, April, 1898	61
Rainfall and Temperature in April, 1898, at 50 Stations	62
Meteorological Notes on April, 1898	63

MAY, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY;

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young*, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXVIII.] MAY, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

THE CLIMATE OF ALGERIA.

WE regret that Dr. Thevenet's interesting work* on the climate of France's most important colony has not earlier received that notice which its importance merits.

In the early volumes of the *Met. Mag.* (V. and VI.) we dealt very fully with the rainfall of Algeria, basing our remarks almost entirely upon Prof. Raulin's works, in which he dealt with the records of the fall of rain from 1838 to 1867. We must revert to this matter after giving a general notice of the work now before us, which deals almost exclusively with observations made in and subsequently to 1875, the date at which the meteorological service of the country was re-organized.

Although the work is beautifully printed and liberally illustrated, Dr. Thevenet has not given a map showing the position of his stations. It is strange how frequently the directors of large systems omit this; probably the facts are so indelibly imprinted upon their own minds that they do not realize, that even with a list of latitudes and longitudes, it gives strangers much trouble to prepare such a map for themselves, and that if once done in their own office (where it would be quite easy to do) it would save all their readers much trouble, or it would induce them to study the work instead of putting it aside until they "had time to find where all the places are."

Temperature.—The subject first dealt with is temperature; and preceding any figures are several very interesting and clearly expressed paragraphs dealing with the physical geography of the country, and with the conditions of temperature produced by solar heat falling on deep sea, on sandy districts like the Sahara, and on various other surfaces. Then come the tables, and here we find a surprise; Dr. Thevenet gives elaborate tables of monthly mean maxima, seasonal maxima, and extreme maxima, and corresponding details respecting the minima; but all through the volume we cannot find the mean annual temperature at a single station. We do not

* Essaie de Climatologie Algérienne, par Dr. A. Thevenet, Directeur du Service Météorologique Algérien. Giralt, Alger, Mustapha. 1896, 4to, 120pp. and 44 plates.

see why on pages 15-16 and 19-21 the values for the year were not given, because then it would have been comparatively easy to have got out the means. We hold that in a book like this the author should work out the results completely, and not leave his readers to do so. There is another point upon which no information is given. From pages 3 to 7 it is evident that the period of observation is not identical at all stations, and with so large a number as 61 stations, covering in some cases 20 years (even at 10 years this would give more than 7,000 months), some records must be imperfect, but there is nothing to show how the missing values have been supplied.

The absolute maximum appears to have been 122° F. in the shade at Orléansville, Lon. 1° 19′ E., Lat. 36° 40′ N., altitude 387 ft.

The absolute minimum is stated as 6°·8 F. at El-Aricha, Lon. 1° 23′ W., Lat. 34° 16′ N., altitude 4,364 ft. Ten or fifteen degrees F. below freezing point is not unusual on the mountains, and sharp frost is not infrequent on the Sahara, but on the Mediterranean coast frost is rare, and at Cap Caxine, a few miles from Algiers, no frost has ever been recorded.

Humidity.—For humidity, as for temperature, no yearly means are given, but the air seems less extremely dry than we imagined; monthly means below 40 per cent. are very rare, except on the high plateaux and on the Sahara. There are, however, some startling figures for the Military Hospital at Ain Sefra (Lon. 0° 36′ W., Lat. 32° 50′ N., altitude 3,560 ft.) where the means for July and August are given as 13·8 and 12·2 per cent.

Evaporation.—As there are here also no yearly totals and the results, except at the Central Office, are from Piche's tubes, we do not quote them; but we may add that, as far as we can make out, the results at Algiers are :—

Piche.	Water Vessel in Shade.	Water Vessel in Sun.
40 inches	53 inches	77 inches.

Rainfall.—This section is very interesting and amply illustrated by coloured maps, and we have no reason whatever to doubt the accuracy of a single statement, and yet we are not content. The author's mode of dealing with the subject affords pleasant reading, and the plates in this work bring all the facts clearly before the reader's mind. Yet the diametrically opposite mode of treatment adopted by Prof. Raulin has great merits. Prof. Raulin tells all he can respecting the rain gauges used, the positions in which they were placed, and he gives every individual monthly and annual total; so that one can see directly upon what data every mean value is based, and has ample data for studying secular variation. Nothing of the kind can be got out of the present work, except for the single city of Algiers, for which a monthly record is given from 1838 to 1895, composed of four different sets of observations; but as the overlapping portions of the records are not given, and there is no imformation respecting the position of any of the gauges, we cannot

tell from this book, whether the undernoted differences are due to secular change or to variety in position. The means are :—

		Inches.	Mm.
M. Don, ingénieur des desséchements.....	1838–47	36·98	939·3
Môle de la Marine et Ponts-et-Chaussées ...	1848–70	28·39	721·1
Hôpital militaire du Dey	1871–83	28·74	729·9
Hôtel-de-Ville d'Alger	1884–95	29·39	746·5
Mean of the whole series		30·16	766·0*

Here we have the last 48 years in three localities agreeing very closely and giving 28·74 inches, and the 10 previous years giving 8 inches, or 29 per cent. more.

The wide divergence of the different records is easily seen by referring to Prof. Raulin's *Observations Pluviométriques faites dans l'Algérie*, Bordeaux, 1876, page 26 *et seq.*; where it will be found that during the six years 1865–70, the Mole, Arsenal, Hospital and Observatory records were all being kept simultaneously, and that the differences between them often amounted to *ten inches*! Our impression is that the true rainfall at, or near, the ground-level is 36 inches, because (1) That was about the mean at the Observatory for 1865–70; (2) It is near that given by the series 1838–47; (3) It is supported by the series for 1855–66 (35 inches) given in *Met. Mag.*, Vol. V., page 50; (4) Several of the gauges giving small totals were very high above the ground, that at the Mole was 12 ft. and those at the Arsenal and Hospital were 20 ft. above the ground; of course they recorded less.

We have been comparing the values given in the present work with those in M. Angot's Memoir in the *Annales Bureau Central Météorologique de France*, 1881, and although M. Angot does explain how he completed imperfect records, we find in it the same absence of original data as in the work now before us. In fact Dr. Thevenet's Memoir of 1896 much resembles M. Angot's of 1883. Dr. Thevenet, however, gives some very effective diagrams of monthly rainfall, which show clearly the wetness of the Algerian winter on the coast and the very small amount at the stations in the interior. At one station, El-Goléa, 1,257 ft. above sea, the average total yearly fall is only two inches and three-quarters (2·82 in.).

In subsequent sections and chapters Dr. Thevenet deals with Hail (very interesting, but we are not sure that regelation plays so prominent a part in its formation as the author seems to attribute to it), Snow, Wind, Barometric Pressure and Weather Forecasting; but our notice is already long, and we must conclude. In doing so, we are glad to say that this book is much more readable than the majority of such works; the author frequently runs off into little disquisitions—semi-physical, semi-meteorological—which, even if one cannot in every case adopt his views, are nevertheless well worth reading, and suggestive. There is, as we have said, no map of the stations, but in all other respects the book is well illustrated.

* Printed as 766·7, which is the sum of the mean monthly values.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858-97.

APRIL.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 A.M. and 9 P.M.		Highest Month.		Lowest Month.		Extremes at 9 A.M. and 9 P.M.				Mean of all Highest	Mean of all Lowest.
					Mean.					Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·931	30·180	29·658	9 a.m.	29·932	30·184	1893	29·664	1859	30·722	17th, 1887	28·911	19th, 1876	30·375	29·381
		1893	1859	9 p.m.	29·931	30·182	1861	29·652	1859	30·677	16th, 1887	28·885	14th, 1859	30·359	29·371
Shade Temp. Dry Bulb	47·3	51·6	43·2	9 a.m.	48·5	53·5	1865	44·2	'87, '88	68·0	20th, 1870	33·5	1st, 1887	58·9	38·8
		1865	1860	9 p.m.	46·1	50·0	1869	41·0	1860	63·2	11th, 1869	31·5	11th, 1879	56·3	36·8
Shade Temp. Max.	58·1	..	...	...	...	67·7	1865	52·4	1888	81·4	27th, 1865	40·0	27th, 1861	70·7	46·2
Shade Temp. Min.	39·7	...	...	...	...	43·2	1867	35·3	1860	54·8	18th, 1865	24·5	1st, 1859	49·1	29·8
Shade Temp. Wet Bulb	44·2	48·1	40·4	9 a.m.	44·9	49·3	1865	40·8	1887	60·0	20th, 1870	31·4	1st, 1859	53·5	36·2
		1865	1860	9 p.m.	43·4	47·0	1869	38·8	1860	57·5	12th, 1872	29·8	12th, 1862	52·4	34·5
Solar Rad., black	95·5	...	...	...	...	106·0	1870	87·6	1884	122·0	12th, 1871	49·8	8th, 1885	114·8	60·9
Solar Rad., bright	67·2	...	...	...	...	76·1	1893	61·6	1879	88·4	25th, 1893	45·0	3rd, 1878	80·5	50·9
Grass Minimum	35·4	...	...	...	...	39·4	1867	30·2	1892	51·0	28th, 1872	19·4	16th, 1862	46·4	24·5
Soil, 1 foot	45·9	...	...	...	...	49·5	1874	42·2	1888	56·2	28th, 1874	37·4	13th, 1879	50·0	42·0
Cloud	5·8	7·1	3·1	9 a.m.	6·2	8·0	1877	3·4	1893	10	Every year	0	Various	10·0	0·4
		1877	1893	9 p.m.	5·3	7·1	1869	2·7	1893	10	Every year	0	Various	10·0	0·0
Rainfall	1·66	4·97	·24	9 a.m.	·81	3·01	1878	·10	1863	2·48	11th, 1878	·00	Every year	·33	·00
		1878	1893	9 p.m.	·85	1·96	1878	·02	1893	·79	25th, 1882	·00	Every year	·32	·00

Max. Rainfall in 24 hours, 2·56 in., 10th, 1878. Mean max. daily fall, ·51 in.

THE DRY WINTER.

We have received so many notes upon the above subject, that we find it difficult to classify them. We have selected three for publication *in extenso* at the end of this note; partly because of their completeness, and partly because by their distance (Woburn is about 80 miles N. of Worthing) they show the wide area over which the want of water exists. Other notes we must take in abstract.

Romney Marsh.—We were told that the ditches in this district which usually, even in summer, are so full of water as to form fences for the sheep, were dry, and the sheep were crossing them. The rector of Old Romney (the Rev. W. Anderson) was kind enough to write as follows:—"There is no doubt that our dykes and ditches are unusually dry, for this period of the year, and in a few cases the graziers have surrounded their pastures with netting. But the sheep are not running from field to field so universally as your quotation seems to imply. . . . . I hear serious apprehensions as to what great trouble there will be in the summer time if the exceptional drought continues." In another letter, he said that one of the principal farmers told him that he did not remember such dryness in March, but his father had often spoken of a great drought in March, 1835.

Tenterden.—The rainfall at this station for the five months September to February, both inclusive, was 6·42 in. instead of 14·07 in., or considerably under half the average. The observer (Mr. Mace) says that his well had (on March 24th) been empty for six weeks, although he had never before known it so for more than one day. Mrs. Mace, who has lived in the house for 55 years, recollects no previous instance; but had heard of one in the summer of 1835. The effect on wells is not uniform, some having water, while others near them have been dry for a long time.

Hitchin.—The dry period may be said to have begun with July, 1897, the following being the average, and the actual, fall month by month:—

Month	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	Total.
Average	2·67	2·33	2·17	2·71	2·29	1·84	2·02	1·47	1·46	1·63	20·59
1897–98	·80	2·07	1·90	·62	1·15	2·32	·54	1·11	1·27	1·30	13·08
Deficiency	1·87	·26	·27	2·09	1·14	+ ·48	1·48	·36	·19	·33	7·51

We can see no other period of ten months equally dry back as far as the record extends, viz., to 1850; but there is a drier *seven* months, viz, :—

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.
1879–80	·61	·75	·51	·26	2·08	·86	1·50

but that succeeded a very wet time, and was followed by a dry May (·88 in.).

To the Editor of the Meteorological Magazine.

SIR,—I see by the *Met. Mag.* that you intend to make some mention next month of the dry time we have lately passed through. The enclosed will, I think, be worth publishing.

The dry time began on the 18th March, 1897, and continued to 22nd March, 1898. During this period the rainfall amounted to 16·87 in. This was 7·66 inches, or upwards of 31 per cent. less than the average rainfall of a year. There were 144 rain days. The average amount on each day was ·117 in., and only on 3 days did the fall exceed ·50 in. These small daily quantities, and the very deficient rainfall in October, November, and January, will tell a tale on our underground springs. Indeed, I already hear of short supply.

In the following table I have, for convenience of comparison, taken the complete calendar year April, 1897, to April, 1898. One inch of rain at the end of March, 1898, brings up the total of the year to 17·40 in. This is 7·13 inches, or rather more than 29 per cent., less than usual.

Rainfall at Aspley Guise, Bedfordshire, from 1st April, 1897, to 31st March, 1898, inclusive, compared with the average rainfall for 25 years—1871 to 1895 :—

Month.	Average.		1897-98.			
	Month.	From Apr. 1.	Month.	Difference.	From Apr. 1.	Difference.
IV.	1·65	1·65	1·46	— ·19	1·46	— ·19
V.	1·93	3·58	1·34	— ·59	2·80	— ·78
VI.	1·92	5·50	1·72	— ·20	4·52	— ·98
VII.	2·76	8·26	·35	—2·41	4·87	—3·39
VIII.	2·19	10·45	3·24	+1·05	8·11	—2·34
IX.	2·33	12·78	1·90	— ·43	10·01	—2·77
X.	2·62	15·40	·88	—1·74	10·89	—4·51
XI.	2·59	17·99	1·15	—1·44	12·04	—5·95
XII.	1·86	19·85	2·59	+ ·73	14·63	—5·22
I.	1·84	21·69	·66	—1·18	15·29	—6·40
II.	1·50	23·19	·86	— ·64	16·15	—7·04
III.	1·34	24·53	1·25	— ·09	17·40	—7·13

Yours truly,

EDWARD E. DYMOND.

Oaklands, Aspley Guise, Bletchley, 1st, May, 1898.

To the Editor of the Meteorological Magazine.

SIR.—It may interest you to know how we have fared for rain during the last seven months, since the amount recorded in my gauge is less than for the corresponding period in any previous year since observations commenced here in 1852 :—

		Fall in inches.	Mean Fall, 1852-96.	+ or −	Decess at end of each month. inches.
1897.	October	0·48	3·89	−3·41	3·41
,,	November	1·75	3·04	−1·29	4·70
,,	December	3·35	2·55	+0·80	3·90
1898.	January	0·81	2·55	−1·74	5·64
,,	February	1·56	1·80	−0·24	5·88
,,	March.....	0·81	1·70	−0·89	6·77
,,	April	1·02	1·56	−0·54	7·31
	Total for 7 months...	9·78	17·09	−7·31	7·31

In the first four months of 1897 there was an excess of rainfall; but for the last twelve months, *i.e.*, from May 1st, 1897, to April 30th, 1898, there has been a decess; which has been most marked from October 1st, 1897, until now. In this period only 18·60 in. fell, against a mean amount of 27·95 in. for the forty-five years, 1852–96.

		Fall in inches.	Mean Fall 1852-96.	Decess at end of each month in inches.
1897.	May	1·03	1·77	0·74
,,	June	2·40	1·95	0·29
,,	July	0·33	2·08	2·04
,,	August	2·76	2·34	1·62
,,	September.....	2·30	2·72	2·04
,,	October	0·48	3·89	5·45
,,	November..	1·75	3·04	6·74
,,	December	3·35	2·55	5·94
1898.	January.....	0·81	2·55	7·68
,,	February	1·56	1·80	7·92
,,	March	0·81	1·70	8·81
,,	April	1·02	1·56	9·35
	Total for 12 months ...	18·60	27·95	9·35

In the years 1854, 1855, 1857, 1861, 1892, and 1896, the fall of rain during the first four months of each year was low, and in three of these years it was lower than this year, but in the previous three months there had been a larger amount than in the last quarter of 1897, so that the present year is the driest I can find recorded here; the amount registered is only two-thirds of the average for the past twelve months.

Last 3 months of	Fall. in.	First 4 months of	Fall. in.	Total Fall for 7 consecutive months. in.
1853.....	9·3	1854.....	3·9	13·2
1854.....	7·5	1855.....	3·0	10·5
1856.....	6·2	1857.....	5·0	11·2
1860.....	8·6	1861.....	5·4	14·0
1891.....	11·89	1892.....	4·08	15·97
1895.....	11·86	1896.....	4·21	16·07
1897.. ...	5·58	1898.....	4·20	9·78

There has been much scarcity of water in the county; shallow wells and springs have given a diminished yield, the ditches and small streams have never been full for some months. The subsoil, however, has remained damp, and the surface has not been dried up by hot weather; hence the meadows and pastures look green, and vegetation has done well through the period.

Yours faithfully,

C. KELLY.

Worthing, May 1st, 1898.

To the Editor of the Meteorological Magazine.

SIR,—I enclose a table showing the mean rainfall of the six winter months, October to March, at five stations in Hertfordshire, for periods of 38 to 48 years, and the rainfall of the three driest winters during the longer period, and indeed for the last 60 years at least. It will be seen that last winter was the driest but one,—that of 1879-80, when the mean rainfall was about an inch and a half less than in the winter of 1897-98. The next driest winter was that of 1890-91, but it had nearly half-an-inch more rain than 1897-98. In the driest winter the fall was less than half the mean. This mean is not quite accurate, being that of varying periods, but it must be very near the true mean.

Yours truly,

JOHN HOPKINSON.

The Grange, St. Albans, May 7th, 1898.

Rainfall of the six winter months, October to March, in Hertfordshire.

Station.	Period.	Winter Mean.	The three driest winters.		
			1879-80.	1890-91.	1897-98.
		in.	ins.	ins.	ins.
Royston	47 years, 1851-98.....	11·28	5·14	7·19	6·66
Hitchin	48 ,, 1850-98.....	12·01	5·07	7·21	7·01
Berkhamsted.....	42 ,, 1856-98.....	15·00	6·91	8·36	8·90
Rothamsted	45 ,, 1853-98.....	13·92	7·03	8·99	8·46
Bayfordbury ..... (*Hertford*).	38 ,, 1860-98.....	12·87	5·40	8·34	6·84
Mean		13·02	5·91	8·02	7·57

(*To be continued in our next.*)

THE GLOOMY SUMMERS OF 1860 AND 1879, AND THE 19 YEARS' CYCLE.

To the Editor of the Meteorological Magazine.

SIR,—Will you kindly print some memories of an old correspondent, which go to show that a cold, gloomy, rainy summer may be expected for 1898, at least in the midland counties?

The sunless, miserable and dripping summers of 1860 and 1879 must live in the memories of meteorologists as well as in their registers, and that, I think, over the whole of England, though my recollections here given are only of Rutland and the adjoining counties.

I would not argue from only two data that because 19 years from gloomy 1860 brought gloomy 1879, *therefore* another 19 years *must* bring us to a gloomy 1898. But there has been so obvious a parallel between most of the last few years, and those years that preceded them by 19 and 38 years respectively, that ground has been given for watching whether 1898 will not prove like 1879 and 1860.

Thus, before 1860 there came the three brilliant summers of 1856, 1857 and 1858. In my early school-boy days at Uppingham a wet day for a cricket match was a thing unknown, and when in 1860 a long bout of rain in the middle of May was followed by an edict that the cricket ground was *not to be used for some days*, it seemed an outrage on the order of nature. Alas! for some months thereafter we had to be thankfully astonished if we could get a dry wicket at all!

Now, the summers of 1895, 1896 and 1897 have been much like those three glories of 1857, 1858 and 1859; and so also, though not quite so much so, were the summers of 1876, 1877 and 1878; with this further resemblance, that in 1878 and 1897 a very brilliant summer came early to an end, and a wet August spoiled what might have been a good harvest.

Again, 1891 with its frequent floods and constant autumn rains was much like 1872, as 1894 was like 1875. The wet year 1852, with its November floods, which make the earliest of my meteorological memories, comes one year too soon to fit in with the cycle.

Further, the dry and splendid 1893 matched 1874 exactly; the quite unique heat and dryness of 1868 found a fair imitation in 1887; 1884 and 1865 go together as good summers with magnificent autumns, and my father tells me that 1846 may be put with these.

I am writing from memory *only* and away from home, so that probably other parallels could be added to the above, even if much may be said *per contra*. Unhappily, records prior to 1860 are none too many, but you, Mr. Editor, have access to most of them. Can you give us in some future number facts as to the years prior to 1857, whether to confirm or to demolish the theory of a 19 year cycle?

I am, yours truly,

H. A. BOYS,
of North Cadbury, Somerset.

Wing Rectory, Rutland, April 26th, 1898.

REVIEWS.

Ueber das Wetterschiessen am südöstlichen Abhange des Bachergebirges nächst Windisch-Feistritz (Steiermark), von ALBERT STIGER. Fritz Rasch Cilli, 1898, 8vo, 12 pages, 2 plates.

ON page 141 of the last volume of the *Meteor. Mag.* will be found, under the title of "Experiments to drive away Hail," an account of the experiments made by Herr A. Stiger on the prevention of hail-storms by the discharge of vertical cannon. That note it will be seen had been furnished by the United States Consul.

Herr Stiger has received so many letters and enquiries upon the subject that he has written this little pamphlet by way of reply. He points out that it was the serious yearly losses to his vineyards which forced him to make the experiment, and he gives a map which shows that 33 stations have now been provided with mortars specially constructed for the purpose, there are also engravings of the patterns adopted, and details of cost; but he seems to ignore the meteorological side of the subject, and does not give the date of a single storm or any data whereby the success of the system can be tested.

Blue Hill Meteorological Observatory. A. LAWRENCE ROTCH, Director. *Exploration of the Air by means of Kites.* [Excerpt Annals Harvard Obs., XLII., Part I.] Cambridge, U.S.A., 1897, 4to, 88 pages, 8 plates.

THIS may be regarded as the official record of the kite work of the Blue Hill Observatory up to the spring of 1897. As we have on several occasions called attention to this important work, we need now merely state that in this memoir (which is beautifully illustrated) Mr. Fergusson deals with the mechanical part of the subject, explaining fully the patterns of kite used, and the arrangements for determining the height they reach, and also the various forms of recording barographs, thermographs and hygrographs carried up by them. Mr. Helm Clayton in the third part of the memoir reports upon the results obtained. We are glad to see that care is taken to determine the height of the kite trigonometrically whenever possible.

The graphic representations of the results obtained are very well drawn, but if Americans are going to adopt the metric scale, we think that at least they might give the scale in feet, yards or miles on one side of a plate like No. 5.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April the 20th, at the Institution of Civil Engineers; Mr. F. C. Bayard, LL.M., President, in the chair. The following new Fellows were elected:—James Tertius Collins, J.P., Francis A. Darton, Marten Llewelyn Evans, and Thomas Jordan Heighington.

Major H. E. Rawson, R.E., read a paper on "Anticyclonic Systems and their movements." Cyclones and anticyclones have long been recognised as powerful weather controls, and their movements studied, but up to the present very little has been written in this country upon the progressive movements of the cores of the high-pressure areas, or anticyclones. The author referred to previous investigations by Abercromby, Scott, Loomis, H. C. Russell and Buchan, and then proceeded to give the results of an examination which he had made of all the available synoptic weather charts for the 11 years, 1881 to 1891. After a preliminary study of the subject, the author found that anticyclones were so frequent in certain localites that he grouped them under the names of "Atlantic," "Greenland," "Scandinavian," and so on. During the period just mentioned (1881–91), there were 212 cases in which the centre or core of an anticyclonic system was over the British Isles, and of these 130 were due to the Atlantic system, 41 to the Scandinavian, and 17 to the Greenland; 22 to the Atlantic and Scandinavian systems extending and merging together, and 2 to the same thing occurring in the case of the Atlantic and Greenland systems. It is thus evident that we owe the greatest number of our anticyclones to the Atlantic system. They occur in all months, but more especially in January, June and October, and are least frequent in April and November. When such anticyclones move away from our area the direction is very much influenced by the season of the year. By far the largest number drift off in some direction between north-east, through east to south, and take the more southerly course in December, January and February. Some few between April and July move west or south-west, and still fewer north or north-west.

The Hon. F. A. Rollo Russell described the results of observations which he had made, chiefly at Haslemere, on haze and transparency during 1897. He found that the greatest clearness occurred with winds from the westward, and the least clearness with winds from the eastward. The highest mean visibility was 24 miles with west winds, and the lowest mean visibility was 10·6 miles with north-east winds.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	59·1	18	28·0	26	51·0	40·3	43·3	88	84·1	23·9	1·04	14	7·9
Malta	72·1	15	50·2	28	67·0	55·9	52·1	78	138·6	44·5	1·69	11	5·6
Cape of Good Hope	86·1	22	47·1	28	70·7	53·3	52·7	71	...	...	·69	7	5·0
Mauritius	86·6	30	64·1	1	83·3	70·1	65·6	72	134·0	56·3	1·05	9	5·9
Calcutta	84·0	4	60·2	30	80·8	65·4	65·4	72	142·2	52·0	·00	0	2·6
Bombay	90·6	13	69·0	20	87·0	72·0	66·4	66	136·4	57·2	·00	0	0·1
Ceylon, Colombo	92·2	...	72·0	...	89·3	74·3	72·7	78	153·0	67·0	11·66	13	4·1
Melbourne	99·0	19	43·2	9	74·8	52·1	49·8	63	144·0	33·8	·85	8	5·0
Adelaide	106·3	10	44·7	3	82·1	57·1	47·2	46	164·6	36·5	·30	6	3·7
Sydney	...	...	...	...	...	...	...	...	...	...	...	...	...
Wellington	66·3	14	39·0	11	62·9	51·1	47·4	70	130·0	32·0	2·35	12	4·9
Auckland	79·0	28	44·0	11	65·6	52·5	46·0	70	135·0	42·0	1·51	13	5·1
Jamaica, Kingston	90·7	8	68·7	25*a*	88·3	71·3	69·4	80	...	...	·48	5	3·4
Trinidad	90·0	9,16	68·0	19	86·8	70·8	72·3	83	168·0	68·0	9·39	18	...
Grenada	85·4	7	71·0	24	82·7	73·4	71·7	74	151·0	...	9·01	25	8·7
Toronto	59·3	5	19·6	23	44·0	31·9	33·9	81	74·0	12·0	4·13	16	7·8
New Brunswick, Fredericton	54·8	27	2·7	24	39·8	23·2	24·0	74	...	...	5·97	14	6·6
Manitoba, Winnipeg	58·2	2	−23·6	27	21·3	5·7	...	...	...	...	·72	6	5·4
British Columbia, Esquimalt	55·9	12	27·4	28	46·1	36·4	39·2	94	...	...	7·30	25	8·5

a and 26.

REMARKS.

MALTA.—Adopted mean temp. 59°·4, or 2°·8 below average. Mean hourly velocity of wind 9·2 miles, or 0·1 below average. T8S on 20th, 22nd and 26th; L on 21st and 30th; H on 26th and 30th. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·6 above, of dew point 1°·4 above, and rainfall ·80 in. below, their respective averages. Mean hourly velocity of wind 10·3 miles, or 0·5 below average; extremes, 23·6 on 18th and 1·6 on 10th. Prevailing direction E.S.E. to E. by N. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. 81°·4 or 1°·7 above, mean dew point 0°·4 above, and rainfall 1·01 in. below, their respective averages. Mean hourly velocity of wind 7·1 miles; prevailing directions N.W., N. and N.N.E. T8S on 10 days, and L on 1st and 29th. Slight earthquake on 17th. H. O. BARNARD.

Adelaide.—A hot, dry month. The mean temp. being 2°·6 above, and rainfall ·69 in. below, the average of 40 years. C. TODD, F.R.S.

Wellington.—Strong N.W. winds almost throughout; showery in the earlier, and dry in the latter, part of the month. T on 10th; S on hills on 10th; H on 10th and 30th. Mean temp. 0°·5 above, and R 1·82 below, average. Earthquakes on 11th and 15th. Solar halo on 19th. R. B. GORE.

Auckland.—Unusually dry, with a predominance of cold S.W. winds. R less than half the average of 30 years; mean temp. slightly under the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—In Kingston mean hourly velocity of wind 1·4 miles. Rainfall one-fifth of the average. Island rainfall a little below the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·53 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·18	XI.	Builth, Abergwesyn Vic.	4·20
II.	Dorking, Abinger Hall .	1·06	,,	Rhayader, Nantgwillt ...	4·23
,,	Birchington, Thor	·69	,,	Lake Vyrnwy	4·33
,,	Hailsham	1·22	,,	Corwen, Rhug	2·27
,,	Ryde, Thornbrough	1·32	,,	Criccieth, Talarvor	2·75
,,	Emsworth, Redlands ...	1·09	,,	I. of Man, Douglas	1·95
,,	Alton, Ashdell	1·85	XII.	Stoneykirk, Ardwell Ho.	1·36
III.	Oxford, Magdalen Col..	1·19	,,	New Galloway, Glenlee	4·58
,,	Banbury, Bloxham	1·85	,,	Monaive, Maxwelton Ho.	4·10
,,	Northampton, Sedgebrook	1·76	,,	Lilliesleaf, Riddell	3·29
,,	Duddington [Stamford].	1·97	XIII.	N. Esk Res. [Penicuick]	2·55
,,	Alconbury	1·56	XIV.	Glasgow, Queen's Park..	1·65
,,	Wisbech, Bank House...	1·21	XV.	Inverary, Newtown	5·55
IV.	Southend	1·22	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	1·45	,,	Islay, Gruinart School ...	1·91
,,	Colchester, Lexden	1·12	XVI.	Dollar.....	2·59
,,	Rendlesham Hall	·86	,,	Balquhidder, Stronvar...	6·97
,,	Rushall Vicarage	1·32	,,	Ballinluig	...
,,	Swaffham	1·14	,,	Dalnaspidal H.R.S.....	5·82
V.	Salisbury, Alderbury ...	1·47	XVII.	Keith H.R.S.....	3·11
,,	Bishop's Cannings	1·81	,,	Forres H.R.S.	1·12
,,	Blandford, Whatcombe .	1·76	XVIII.	Fearn, Lower Pitkerrie..	1·74
,,	Ashburton, Holne Vic...	4·05	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	2·25	,,	Invergarry.....	1·88
,,	Hartland Abbey	1·90	,,	Aviemore H.R.S.	1·63
,,	Lynton, Glenthorne ...	2·08	,,	Loch Ness, Drumnadrochit	1·66
,,	Probus, Lamellyn	2·17	XIX.	Invershin	5·26
,,	Wellington, The Avenue	1·88	,,	Durness.....	3·20
,,	North Cadbury Rectory	1·85	,,	Watten H.R.S.....	2·41
VI.	Clifton, Pembroke Road	2·23	XX.	Dunmanway, Coolkelure	7·78
,,	Ross, The Graig	1·76	,,	Cork, Wellesley Terrace	4·00
,,	Wem, Clive Vicarage ...	1·67	,,	Killarney, Woodlawn ...	7·16
,,	Wolverhampton, Tettenhall	1·24	,,	Caher, Duneske	3·16
,,	Cheadle, The Heath Ho.	2·30	,,	Ballingarry, Hazelfort...	3·96
,,	Coventry, Priory Row ..	2·31	,,	Limerick, Kilcornan ...	2·42
VII.	Grantham, Stainby	1·86	,,	Broadford, Hurdlestown	3·15
,,	Horncastle, Bucknall ...	2·41	,,	Miltown Malbay	2·95
,,	Worksop, Hodsck Priory	2·50	XXI.	Gorey, Courtown House	4·07
VIII.	Neston, Hinderton	1·69	,,	Athlone, Twyford	3·70
,,	Southport, Hesketh Park	1·98	,,	Mullingar, Belvedere ...	3·40
,,	Chatburn, Middlewood.	2·03	,,	Longford, Currygrane...	4·24
IX.	Melmerby, Baldersby ...	2·89	XXII.	Woodlawn	3·07
,,	Scarborough, Observat'y	2·88	,,	Crossmolina, Enniscoe ..	4·70
,,	Middleton, Mickleton ...	2·83	,,	Collooney, Markree Obs.	3·13
X.	Haltwhistle, Unthank...	3·63	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	3·01	XXIII.	Warrenpoint.....	5·80
,,	Duddon Valley, Ulpha School	6·40	,,	Seaforde..	3·20
,,	Keswick, The Bank	4·55	,,	Belfast, Springfield	3·70
XI.	Llanfrechfa Grange	2·53	,,	Bushmills, Dundarave..	3·19
,,	Llandovery	4·26	,,	Stewartstown	4·73
,,	Castle Malgwyn	2·54	,,	Killybegs	4·21
,,	Brecknock, The Barracks	1·56	,,	Horn Head	2·85

APRIL, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·01	— ·73	·21	27	12	66·5	8	28·9	6
II.		Tenterden ...	1·22	— ·50	·39	26	11	65·0	8	31·0	5
,,		Hartley Wintney ...	1·57	...	·32	11	13	68·0	16	...	...
III.		Hitchin ...	1·30	— ·49	·26	27	12	65·0	8	26·0	4
,,		Winslow (Addington) ...	1·82	— ·10	·35	28	11	67·0	8	23·0	5
IV.		Bury St. Edmunds (Westley)	1·48	— ·18	·31	27	12	63·0	8	29·0	1
,,		Norwich (Brundall) ...	1·22	...	·31	26	12	66·0	8	27·4	1
V.		Winterbourne Steepleton ...	1·72	...	·65	14	15	58·2	26	24·9	6
,,		Torquay (Cary Green)	1·27	...	·55	28	11	57·6	12	34·0	5
,,		Polapit Tamar [Launceston]..	1·91	— ·31	·66	29	11	62·0	8	24·0	5
VI.		Stroud (Upfield) ...	2·24	+ ·09	·46	11	14	62·0	7, 8	33·0	4
,,		ChurchStretton(Woolstaston)	1·86	— ·48	·44	11	13	64·0	8	31·5	5
,,		Worcester (Diglis Lock) ...	1·55	— ·16	·26	29	16	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·26	...	·88	11	14	...	...	...	...
,,		Boston ...	2·24	+ ·53	·60	11	11	68·0	8	25·0	6
,,		Hesley Hall [Tickhill]...	2·33	+ ·62	·93	11	14	63·0	8	24·0	4
VIII.		Manchester(PlymouthGrove)	2·09	+ ·38	·70	11	18	67·0	8	32·0	1
IX.		Wetherby (Ribston Hall) ..	4·14	+ 2·29	1·82	11	13	...	...	...	...
,,		Skipton (Arncliffe) ...	6·44	+ 3·01	1·09	6	21	...	...	...	...
,,		Hull (Pearson Park).	2·88	+ ·96	·97	11	13	68·0	8	27·0	5
X.		Newcastle (Town Moor) ...	2·04	+ ·21	·55	28	11	...	...	...	...
,,		Borrowdale (Seathwaite)...	11·16	+ 4·02	2·61	9	18	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	1·51	— ·90	·28	8	11	...	...	...	...
,,		Haverfordwest	3·11	+ ·48	·87	13	11	61·8	8	25·8	5
,,		Aberystwith (Gogerddan) ...	2·61	+ ·05	·74	11	11	65·0	8	..	...
,,		Llandudno... ...	2·19	+ ·38	·65	11	13	65·0	8	32·5	5
XII.	SCOTLAND.	Cargen [Dumfries]	4·68	+ 2·45	·76	6	16	59·0	18	23·6	5
XIII.		Edinburgh (Blacket Place)...	1·91	...	·57	28	15	61·3	22	28·3	5
XIV.		Colmonell ...	3·50	...	·89	13	12	67·0	22	31·0	15
XV.		Tighnabruaich ...	3·95	...	·65	10	17	58·0	25a	29·0	5
,,		Mull (Quinish) ...	4·27	+ 1·29	·74	8	21	...	...	...	...
XVI.		Loch Leven Sluices ...	3·70	+ 1·48	1·30	29	12	...	...	...	...
,,		Dundee (Eastern Necropolis)	4·40	+ 2·35	·95	28	15	59·0	9	26·8	5
XVII.		Braemar	4·41	+ 1·99	1·36	13	19	60·6	22	23·2	5
,,		Aberdeen (Cranford)	5·51	...	1·20	29	21	60·0	10b	27·0	4
,,		Cawdor (Budgate) ...	1·64	+ ·12	·35	15	18	...	...	...	...
XVIII		Strathconan [Beauly] ...	5·05	+ 2·24	·82	30	10	...	...	...	...
,,		Glencarron Lodge...	5·57	...	·90	10	20	65·8	22	28·6	5
XIX.		Dunrobin ...	3·04	+ 1·31	·50	29	15	56·5	24	35·0	12
,,		S. Ronaldshay (Roeberry) ...	4·33	+ 2·72	1·04	15	21	57·0	8	32·0	2, 3
XX.		Darrynane Abbey...	6·03	...	1·40	22	21	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·94	+ 2·47	·89	29	16	61·0	27	29·0	1
,,	IRELAND.	O'Briensbridge (Ross) ...	3·66	...	·49	17	19	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	4·15	+ 1·87	·77	11c	15	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·67	+ ·55	·96	30	16	64·7	7	33·4	5
XXII.		Ballinasloe	3·16	+ ·82	·71	12	19	...	...	...	...
,,		Clifden (Kylemore)	6·50	...	1·22	9	15	...	...	...	...
XXIII		Waringstown ...	3·28	+ ·86	·45	30	15	67·0	22	25·0	4
,,		Londonderry (Creggan Res.).	3·93	+ 1·69	·74	17	24	...	...	...	...
,,		Omagh (Edenfel) ...	3·70	+ 1·47	·69	17	18	65·0	21	26·0	4

+ Shows that the fall was above the average ; — that it was below it.

a—and 26. *b*—and 11. *c*—and 30.

METEOROLOGICAL NOTES ON APRIL, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

TENTERDEN.—After the heavy snow-falls of March, dry, cold weather set in again for 4 weeks, broken only by slightly warmer nights and a few showers from 8th to 16th. Only 3 days with temp. above 60°, fewer than in any April since 1891. Warm, showery weather, after a TS on 26th, was very acceptable. Duration of sunshine, 177 hours.

HARTLEY WINTNEY.—The first 10 days were very spring-like, with light, soft and warm S.W. winds. Most of the R fell in the second and last weeks of the month. Keen, harsh N.E. winds prevailed from 19th to 27th. R ·18 in. above the average; mean max. temp. 61°·3, mean min. 30°·2; ozone on 20 days; distant T on 9th.

ADDINGTON.—Frost occurred on grass on a good many mornings, but little damage was done. The weather was favourable for all outdoor operations, and vegetation of all kinds was in a rather advanced state at the end. More than half of the R fell in the last five days. Swallows seen on 9th, cuckoo and nightingale heard on 19th.

BURY ST. EDMUNDS, WESTLEY.—Cold, with several sharp frosts, and only one day with temp. above 60°. Very dry from 13th to 25th, then nice rains and growing weather. Distant T on 10th.

NORWICH, BRUNDALL.—Fine at first, showery about Easter, then 10 days of exceedingly cold E. winds, keeping back vegetation. The month ended with showery weather. Mean temp. 47°·3. R ·45 in. below the average. T and L in evening on 10th; T at 4 p.m. on 16th. Lunar halo on 27th.

WINTERBOURNE STEEPLETON.—The month was dry, with very cold nights. Mean temp. 45°. In the latter half the wind was mostly E. or N.E., and the weather was the reverse of "growing," until R came on the 27th. Fog on 3 days.

TORQUAY, CARY GREEN.—R 1·15 in. below the average. Mean temp. 48°·5, or 0°·4 above the average. Duration of sunshine 192 hours 5 mins., being 13 hours 30 mins. above the average; one sunless day.

POLAPIT TAMAR.—Rather dry on the whole. S.W. gale on 30th. R for the first four months of the year 3·37 in. below the average.

WOOLSTASTON.—A cold and backward month. Mean temp. 47°·8. T with vivid L on 15th; T on 29th; gale on 29th and 30th.

WALES.

HAVERFORDWEST.—April commenced with keen ground frosts and fine bright days. Very low temp. on grass, 12 readings being below 25°. Much of the R fell during the night, so that the month might be characterised as bright and sunny, with very cold nights. Moderate gales from 8th to 10th; the 11th

disastrously wet. Fine weather from 14th until 29th. R and storms at the end. Vegetation very forward and hay very promising.

ABERYSTWITH, GOGERDDAN.—The weather on the whole was very good, with a few nice growing showers.

SCOTLAND.

CARGEN [DUMFRIES].—The cold weather at the end of March continued for the first five days of April, when a welcome change occurred, and the mean temp. from 6th to 14th was 49°. Light S winds prevailed during this time, and gentle R fell each day, except 12th. The temp. during the rest of the month was rather lower, and E. winds blew from 24th to 30th, marring the prospect of an early spring. R the greatest recorded in April in 38 years, 1871 being the only other year with more than four inches. T for several hours on the 29th. S. winds on 20 days. Sunshine slightly exceeded the average. Although by no means an early spring, the weather was very favourable for vegetation, and farm work is in a forward state.

EDINBURGH, BLACKET PLACE.—Mean temp. 2°·7 above the average, being the seventh consecutive month with a mean above the average of 134 years. R normal, but bright sunshine (94 hours) much below the mean. Distant T at 2.45 p.m. on 10th; solar halo on 19th.

COLMONELL.—R 1·15 in., and mean temp. 4°·0, above the average of 22 years. H on 4th; T, L and H on 11th.

TIGHNABRUAICH.—A good month for the spring season. T on 30th.

MULL, QUINISH.—Mild, wet, and very unsettled. The rainfall has only twice been exceeded since the gauge was established in 1874; namely, in 1880 and 1882. Vegetation very forward.

ABERDEEN, CRANFORD.—Very cold and wet.

S. RONALDSHAY, ROEBERRY.—The wettest April for 31 years. Mean temp. 44°·1, or 0°·3 above the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—A wet month; the first half mild and stormy, with a strong gale on 10th.

WATERFORD, BROOK LODGE.—R about double the average. Fog on 4 days; T on 10th and 15th.

O'BRIENSBRIDGE, ROSS.—Rainfall more than the average. Temp. generally low, with squalls and fog. Very little frost. T, L and H, on 14th. Vegetation backward.

DUBLIN, FITZWILLIAM SQUARE.—A mild, genial spring month, very favourable to vegetation. Heavy rains on 11th, 23rd and 30th made up 75 per cent. of the total for the month. A remarkable and sudden increase of temp. occurred between 5th and 6th. Mean temp. 49°·7, or 2°·0 above the average. Fog on 5 days. High winds on 8 days and gales on 2. H on 10th. Temp. in shade above 60° on 6 days. Solar halos on 4 days; lunar halo on 1st.

OMAGH, EDENFEL.—The wettest April for 34 years except 1871, but following on a dry seed-time, and with a mean temp. somewhat above the average, all crops present a favourable appearance. The principal summer migrants arrived about a week earlier than the average.

No. CCCLXXXIX.]
VOL. XXXIII.

[PRICE FOURPENCE
Or 4s. per annum post free

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

THE NEW YORK PUBLIC LIBRARY

CONTENTS

	PAGE
Lightning Conductors	65
The Dry Winter in the S.E. of England	66
Royal Meteorological Society	67
Results of Meteorological Observations at Camden Square for May for 40 years, 1858–97	68
Summer Rainfall	69
A Long, if not Unique, Wet Record	70
The Heavy Rainfall at Jewell, Anne Arundel County, Maryland, U.S.A., July 26th and 27th, 1897	72
The Gloomy Summers of 1860 and 1879, and the 19 Years' Cycle...	73
REVIEW:	
Weather Lore: A collection of Proverbs, Sayings and Rules concerning the Weather	75
Climatological Table for the British Empire, December, 1897 ...	76
Supplementary Table of Rainfall, May, 1898	77
Rainfall and Temperature in May, 1898, at 50 Stations ...	78
Meteorological Notes on May, 1898	79

JUNE, 1898

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy Meteorological Societies, and of the British Astronomical Association; Article by various eminent Astronomers, English, American, and Continental Correspondence on topics of interest connected with the Science; Notices Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assistan and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuab publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YOR
PUBLIC LIBRA
ASTOR, LENOX AND
TILDEN FOUNDATION

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIX.] JUNE, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

LIGHTNING CONDUCTORS.

To the Editor of the Meteorological Magazine.

SIR,—Having recently been appointed one of the Churchwardens of Bradestone Church, I have had the usual string of requisitions from the Archdeacon, amongst which is "Has the Church a lightning conductor?" After replying in the negative, I drew our rector's notice to the matter, and was surprised to hear from him that architects put forth the theory that *old* churches which *have never been struck* do not require conductors, as the probability is that they never will be struck. Now this is to me quite a new theory, and I should be glad to hear whether it has ever been brought to your notice. I am aware that some churches which have been struck have been so on *several occasions*, *e.g.*, Redenhall Church, near Harleston, Norfolk, and I think Oundle, in Northamptonshire. But certainly the reverse theory is news to me.—Yours very truly,

ARTHUR W. PRESTON.

Bradestone House, Brundall, Norwich, 20th May, 1898.

[We had never heard the suggestion, but are not prepared to say that it is wrong, and shall be glad to receive any evidence on either side. There is, however, the case of Rouen Cathedral,* struck in 1110, 1117, 1284, 1351, 1625, 1627, 1642, 1768, 1822, and never since it was provided with a conductor.

We have just seen in the newspapers the following paragraph, which appears unfavourable to the theory.—ED.]

"During a violent thunderstorm at Dartford on the evening of May 31st, a flash of lightning struck the tower of the ancient parish church, and caused serious damage. The flagstaff was shattered, and other portions of the woodwork were thrown upon the roof. The electric current passed down the rain-pipe, which is shattered,† to the ground, where a large hole was made. The damage is estimated at £300. The tower is the oldest part of the church, and was formerly a fortification, which had been built upon some Roman foundations."

* *Report of the Lightning Rod Conference*, p. 161.
† Therefore probably there was no conductor.

THE DRY WINTER IN THE S.E. OF ENGLAND.

(*Continued from page 56*).

INASMUCH as the exceptional drought did not extend to the N.W. of England or to Scotland, we have altered the heading so as to make that fact clear.

Appledore.—The water level of a large tract of low-lying land is kept down by powerful pumps at Appledore, under the care of Mr. E. Case, C.E. Mr. Mace sent us a copy of part of a letter which he had received from Mr. Case, viz.: "We certainly never had the water at such a low level in the month of March. No pumping has been required, which is unprecedented, and we merely ran the engine for a few hours on two or three occasions to see that it was in working order." We enquired how far back the record extended, and Mr. Case replied "The man in charge tells me that to his knowledge there has not been so dry a winter as the past for 30 years. As far as I can ascertain there has always been some pumping required."

Chilgrove.—The facts for this station, as shown by the table on p. 71, are very striking; they are as under :—

	Jan.	Feb.	Mar.	April.	May.	Mean, Jan.-March.
Average 43 years, 1853-97	194	194	193	181	147	194
1898.....	143	147	145	143	141	145
Deficiency in 1898...	51	47	48	38	6	49
Only years since 1852 *in which lower levels were recorded in any of these months.*						
1855.....	**130**	**138**	**132**	**135**	**138**	**133**
1859.....	**132**	157	157	156	156	149
1885.....	**134**	173	192	178	183	166
1891.....	**139**	159	175	171	162	158
1898.....	**143**	**147**	**145**	**143**	**141**	**145**

This shows that, during the first three months of 1898, the water level was lower than in any corresponding period since 1855.

Tenterden.—As, unfortunately, the corrections in the proof of the paragraph on page 53 were overlooked, it will be better to re-write it, incorporating such further facts as Mr. Mace has reported to us. Firstly, as regards the rainfall, the true mean by the Snowdon gauge for the period 1880-89 for the five months, October to February, both inclusive, was 14·07 in.; the fall in 1897-98 was 6·36 in., or only 45 per cent. of the mean; Secondly, concerning wells, the following facts have been mentioned by Mr. Mace: On March 21st, "Empty wells becoming more numerous, and rain water also deficient now." On March 24th, before the snow, "Our well has been almost empty for 57 days, I never knew it so for more than one day before, nor does Mrs. Mace who has lived in the house nearly 55 years. A deep well that was low last autumn has now 50 ft. or 60 ft. of water. The well at Summerhill has also been nearly dry for a long time." On May 6th, "The Hales Place spring still supplies the household, but in previous years 2,000 gallons a day have run to waste." Thirdly, as to the ditches and the sheep, we find the following

notes on March 22nd: "On Shirley Moor, between Tenterden and Appledore, I noticed dry ditches, but others, often dry in summer, had water in them. I learned that in Romney Marsh, there was already some running together of sheep, and likely to be more. Where ditches have been made out during recent dry autumns there is generally a little water, but others are in many cases passable. A man told me that he had no difficulty in getting across when coursing. The state of affairs is certainly most abnormal."

ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday afternoon, May the 18th, at the rooms of the Royal Astronomical Society, Burlington House, Mr. F. C. Bayard, LL.M., President, in the chair.

Horatio H. Bentley, and Frederick George Haworth, M.B., C.M., D.P.H., were ballotted for, and duly elected Fellows of the Society.

Mr. R. H. Scott, F.R.S., read a paper on the frequency of rainy days in the British Islands. He had taken the number of rainy days in each month at 40 Stations for the 20 years 1876-95, and then divided that number by the total number of days in the month, and so ascertained the resulting percentage. The greatest excess of frequency is always on the extreme north and west coasts. The highest figures of all being found at Dunrossness (Shetland), and at Stornoway in most months, but especially in the late autumn and winter. In summer the figures for the west of Ireland are higher.

The map for the year exhibits the highest percentage, 70, in the extreme north, while all the Atlantic coasts, from Scilly up to the Pentland Firth, reach 60. Over England and Wales the values are, as a whole, fairly uniform. Leith and Shields come out as dry with 49, while all the South, Midland, and South-eastern stations, except Hastings, exhibit figures below 50. June and September are the two months with the best chance for rainless days, and November is the month with the greatest frequency of rainy days.

Mr. F. J. Brodie read a paper on the abnormal weather of January last, which was one of the most remarkable winter months on record. The month was singularly dry, with an absence of snow or sleet; a somewhat unusual feature in January even for any individual station, but far more remarkable as applying to the country as a whole. The special feature, however, was the striking absence of severe frost, the frequent prevalence of unusually mild weather, and as a result, the abnormal warmth of the month, especially in the more northern parts of the kingdom. The mean temperature was generally over the whole country about 5° above the average, while at many places situated in the more northern parts of the kingdom it was more than 6° above the average. The atmospheric pressure throughout the month was also very high, the mean being from two to three tenths of an inch above the average.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

MAY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
						Highest Month.		Lowest Month.		Highest.		Lowest.		Mean of all Highest	Mean of all Lowest.
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·978	30·236	29·784	9 a.m.	29·979	30·244	1896	29·781	1878	30·643	8th, 1881	28·980	1st, 1858	30·380	29·489
		1896	1878	9 p.m.	29·978	30·228	1896	29·787	1878	30·650	10th, 1881	29·083	1st, 1858	30·364	29·510
Shade Temp. Dry Bulb	53·3	58·6	49·2	9 a.m.	55·1	61·7	1868	50·5	1879	78·2	19th, 1868	38·7	10th, 1883	67·0	45·5
		1868	1879	9 p.m.	51·6	55·5	1868	47·2	1876	72·4	30th, 1895	35·5	3rd, 1877	62·6	41·8
Shade Temp. Max.	64·7	..	...	...	...	70·4	1868	59·3	1879	87·6	19th, 1868	42·5	1st, 1866	78·1	51·9
Shade Temp. Min.	44·4	...	...	...	...	49·3	1889	40·5	1876	60·3	31st, 1895	28·4	7th, 1892	54·5	33·8
Shade Temp. Wet Bulb	49·2	54·4	45·6	9 a.m.	50·1	56·3	1868	46·3	1879	65·1	18th, 1862	36·9	12th, 1897	59·6	41·4
		1868	1879	9 p.m.	48·2	52·6	1889	44·5	1876	63·8	30th, 1895	33·0	3rd, 1877	57·9	39·2
Solar Rad., black	106·1	...	...	...	...	114·0	1882	94·8	1886	131·5	26th, 1880	58·0	9th, 1883	124·0	71·1
Solar Rad., bright	75·6	...	...	...	...	81·8	1893	68·7	1879	98·7	30th, 1895	50·6	18th, 1891	90·5	58·2
Grass Minimum	40·3	...	...	...	...	46·9	1889	35·7	1876	56·8	30th, 1862	23·1	7th, 1892	51·5	28·8
Soil, 1 foot	52·3	...	...	...	...	56·6	1893	48·5	1879	60·9	31st, 1895	43·4	5th, 1877	57·3	47·6
Cloud	5·5	7·2	3·8	9 a.m.	5·9	7·7	'79, '87	4·2	1895	10	Every year	0	Various	10·0	0·3
		1869	1895	9 p.m.	5·0	7·2	1869	3·5	1895	10	Every year	0	Various	10·0	0·1
Rainfall	1·92	4·79	·14	9 a.m.	·96	3·22	1886	·01	1880	1·20	29th, 1879	·00	Every year	·38	·00
		1886	1896	9 p.m.	·96	2·18	1878	·02	1896	1·27	7th, 1878	·00	Every year	·40	·00

Max. Rainfall in 24 hours, 1·71 in., 7th, 1878. Mean max. daily fall, ·60 in.

SUMMER RAINFALL.

To the Editor of the Meteorological Magazine.

SIR,—The following account of this may be found interesting. Consider the rainfall of the four months May to August (which we may here call "summer") at Greenwich, since 1841. Any of these seasons with a rainfall over the average of 56 years (*viz.*, 8·69 in.) we may call "wet," and any under the average "dry."

Then, taking as years of maximum sunspots, 1848, 1860, 1870, 1884, and 1894, I find that the following holds good :—

1. *In every group of five consecutive years, having a sunspot maximum year third (or central), there have been more dry summers than wet.*

The data are these :—

	Rain.			Rain.			Rain.	
1846	7·50	d.	1858	7·70	d.	1868	5·81	d.
1847	5·52	d.	1859	8·18	d.	1869	6·34	d.
1848	10·13	w.	1860	16·18	w.	1870	4·89	d.
1849	7·35	d.	1861	6·46	d.	1871	7·74	d.
1850	7·82	d.	1862	9·44	w.	1872	9·79	w.

	Rain.			Rain.	
1882	7·34	d.	1892	8·50	d.
1883	5·76	d.	1893	5·93	d.
1884	5·64	d.	1894	9·85	w.
1885	5·60	d.	1895	6·19	d.
1886	8·30	d.	1896	5·34	d.

(In these tables d means dry and w wet.)

It will be asked, Does the corresponding and opposite statement for sunspot minima also hold good? The reply is as follows :—

2. *In every group (except one) of five consecutive years having a sunspot minimum year third (or central), there have been more wet summers than dry.*

Taking as sunspot minimum years, 1843, 1856, 1867, 1879, and 1890, the data are these :—

	Rain.			Rain.			Rain.	
1841	10·56	w.	1854	8·78	w.	1865	13.06	w.
1842	7·78	d.	1855	9·30	w.	1866	9·62	w.
1843	11·09	w.	1856	8·37	d.	1867	12·56	w.
1844	5·75	d.	1857	6·63	d.	1868	5·81	d.
1845	9·05	w.	1858	7·70	d.	1869	6·34	d.

	Rain.			Rain.	
1877	7·42	d.	1888	14·49	w.
1878	14·55	w.	1889	9·24	w.
1879	16·56	w.	1890	10·92	w.
1880	7·55	d.	1891	10·76	w.
1881	9·50	w.	1892	8·50	d.

The second of these groups is exceptional (more dry than wet). If we took 1855 for the central year instead of 1856, we should obtain conformity to the general type (more wet than dry).

Are we to consider these relations fortuitous? If they afford any presumption for future years, they might, I think, be found practically useful in some cases.

Some facts may here be given as to the continuance of a given type of summers (wet or dry). The longest homogeneous series is the *six* dry summers, 1882–87. Next we have *five* wet summers, 1851–55. Then there are two cases of *four* dry summers coming

together (1856–59 and 1868–71), and one of *four* wet summers (1888–91), two cases of *three*, &c. Thus, the persistence is seldom great.—Yours faithfully, ALEX. B. MACDOWALL.

ADDENDUM.—Since writing the above, I have looked into the previous data of Greenwich rainfall for 1815 to 1840, published in the *Proceedings* of the Meteorological Society. The value of these is, of course, inferior to that of the series since 1841, but the result of the inquiry may be given. Treating the summer values in the same way, in relation to the average for those 26 years (*viz.*, 9·01), I find one exception to each of the two rules above indicated; this makes, for the whole period 1815–1897, one exception to rule No. 1 and two to No. 2.

I have accordingly sought a still more comprehensive expression of relations, and offer the following:—

1. *In the first five years after sunspot minimum years, there have always been more dry summers than wet.*

This holds good since 1815 (*i.e.*, in seven cases); and it is to be borne in mind that the sunspot maximum follows the minimum at a shorter interval than the minimum does the maximum, usually three or four years.

2. *In each group of five consecutive years ending with a sunspot minimum year, there have been (with one exception) more wet summers than dry.* The exception is the five-year group ending in the sunspot minimum year 1823 (three dry summers to two wet).

Briefly, the fact which seems to emerge from the above is this: a tendency to *wet* summers when sunspot minima are approaching, and to *dry* when they have passed (or, in general, near maxima). We are now probably in the former case.

A LONG, IF NOT UNIQUE, WELL RECORD.

IN the first volume of this *Magazine*, on page 29 (issued May 16th, 1866), we gave (by the courtesy of the late Mr. Leyland Woods) details of the level of water in the well at his seat, Chilgrove, near Chichester, for the years 1853 to 1865. We recently heard that there were earlier records, and as the observations have been continued to the present time, there are, of course, more than 30 subsequent years. Mr. J. W. Woods has very kindly gone through the entire record, and sent us a copy. In so long a series (62 years) there are naturally some omissions, and the observations have not always been taken on the same day of the month, moreover the well was deepened in February, 1855, and it is uncertain whether it was lowered 10 or 12 feet. Recognizing these drawbacks, we yet believe the record to be so nearly unique that we have had the whole prepared for the press, converting Mr. Woods's records of depth into the corresponding height above Ordnance datum, as thereby the comparability of the values is ensured, irrespective of the deepening of the well. We have accepted Mr. Leyland Woods's values, viz: for the altitude of the brim of the well, 266 ft. above sea level; 135 ft. as the original, and 145 ft. as the present depth.

Approximate height (in feet above ℞) of top of water in well at Chilgrove.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1836	..	174	211	231	214	174	165	152	*132*	139	169	216	..
7	201	239	227	181	162	154	*148*	149	138	135	134	137	167
8	138	140	165	167	157	152	145	*140*	139	135	133	180	149
9	201	210	204	*194*	179	168	159	151	146	183	212	226	186
1840	179	236	194	174	*158*	154	146	138	135	134	132	168	162
1	167	187	198	181	173	166	161	..	..	..	..	*261*	..
2	..	..	..	..	..	..	151	*146*	140	134	134	174	..
3	*207*	193	186	*168*	179	201	189	177	156	152	145	181	178
4	178	205	191	216	182	165	159	146	139	135	134	139	166
5	143	156	163	162	162	157	153	148	143	139	137	150	151
6	174	247	219	196	187	167	159	150	144	140	152	163	175
7	164	169	206	189	161	155	149	142	138	134	*130*	*130*	156
8	137	167	218	233	215	*189*	168	157	174	172	193	193	185
9	221	220	197	188	175	175	170	159	149	143	143	143	174
1850	185	171	190	177	183	176	166	159	151	148	143	155	167
1	179	..	..	..	..	..	..	..	..	..	*130*	*130*	..
2	..	133	..	..	..	..	..	..	..	..	226	264	..
3	266	211	191	181	183	174	171	171	180	229	215	185	196
4	185	191	179	169	161	155	148	146	145	144	*130*	*130*	157
5	*130*	138	132	135	138	139	136	134	*130*	132	156	165	139
6	197	196	177	175	165	162	160	152	147	151	152	183	168
7	192	180	172	168	161	153	147	142	138	146	154	159	159
8	159	160	161	161	156	152	146	142	138	134	132	131	148
9	132	157	157	156	156	157	146	141	136	135	159	197	152
1860	228	212	181	174	171	204	185	186	186	205	206	221	197
1	214	186	187	187	171	158	150	145	142	139	161	191	169
2	178	182	217	203	181	169	159	152	146	151	163	186	174
3	216	202	180	164	154	151	148	144	140	144	158	180	165
4	180	183	211	180	167	156	151	146	137	135	133	137	160
5	153	188	190	171	159	152	146	141	140	166	226	212	170
6	212	260	228	188	174	161	151	150	144	150	152	180	179
7	187	209	201	207	205	161	157	152	147	145	145	146	172
8	149	195	177	172	169	158	150	144	138	137	134	136	155
9	233	232	234	201	182	172	160	..	..	145	..	..	..
1870	..	..	..	..	..	156	152	151	137	..	..	..	..
1	167	..	..	..	..	170	161	161	161	160	157	155	..
2	153	257	222	206	191	176	161	155	149	144	194	229	186
3	259	240	224	208	192	176	160	144	141	137	133	143	180
4	143	151	166	171	165	159	153	147	141	135	135	213	157
5	213	214	235	213	186	163	157	150	147	144	144	214	182
6	185	175	200	219	191	177	168	159	152	143	141	137	171
7	246	252	225	199	198	186	176	164	158	152	148	226	194
8	220	203	206	199	182	174	170	163	154	149	145	211	181
9	218	239	205	184	179	193	205	232	217	205	173	167	201
1880	159	170	178	171	159	152	146	141	141	203	219	227	172
1	213	226	223	193	173	158	155	149	149	153	206	241	187
2	216	191	180	181	172	170	156	152	146	235	233	224	188
3	227	254	209	181	166	159	153	149	145	144	183	181	179
4	182	216	221	188	169	159	152	146	142	134	131	131	164
5	134	173	192	178	183	185	178	169	161	157	171	179	172
6	203	205	181	189	174	168	159	146	145	141	174	250	178
7	245	207	183	163	157	149	145	141	137	135	138	167	164
8	164	161	172	180	170	161	160	179	165	155	175	192	170
9	184	185	192	175	170	166	157	149	144	146	162	171	167
1890	204	192	174	164	162	157	152	149	147	143	140	139	160
1	139	159	175	171	162	159	147	144	158	232	228	242	176
2	201	183	169	157	154	148	143	139	136	135	165	192	160
3	179	195	197	174	158	149	143	140	134	133	132	145	157
4	225	216	202	181	164	154	143	144	140	145	243	216	181
5	219	196	167	164	162	159	151	145	142	139	166	199	167
6	190	178	195	186	164	155	142	141	142	162	163	204	169
7	211	225	238	205	184	171	158	146	142	138	135	135	174
8	143	147	145	143	141	..	..	..	..	..	..	..	..

THE HEAVY RAINFALL AT JEWELL, ANNE ARUNDEL COUNTY, MARYLAND, U.S.A., JULY 26TH & 27TH, 1897.

(From the Report for December, 1897, of the Maryland Section of the U.S. Climate and Crop Service.)

PROBABLY the heaviest rainfall ever recorded in Maryland fell at Jewell during the eighteen hours from 6 p.m. July 26th to noon of the 27th, the amount measured being 14·75 inches. In a personal interview with the voluntary observer, Mr. J. Plummer, some of the details of the storm were learned.

During the day of the 26th, the wind blew steadily from the north-east. A little before 6 p.m. a thunderstorm suddenly came up from the south-west, accompanied by a heavy downpour of rain, which continued with varying intensity through the entire night and until noon of the following day. The heaviest fall occurred between 6 p.m. and 9 p.m. of the 26th.

The rain gauge is of the standard 8-inch Weather Bureau pattern, holding when filled a 2-inch rainfall. In measuring the contents about noon of the 27th, the observer found the receiver filled and enough in the overflow to fill the receiver six times, with three-fourths of an inch left over, making a total of 14·75 inches. The exposure of the gauge is excellent, being on open ground, raised about 3 feet above the surface, and distant about 60 feet south-east from the two-storey dwelling of the observer. Jewell is situated in the southern extremity of Anne Arundel County, near the Calvert County line, and about three miles from Chesapeake Bay, in about 38° 40′ N. and 76° 32′ W., and about 25 miles S.E. of Washington. The surrounding country is generally rolling, with no marked contrasts in elevation. The vicinity of the station is about 160 feet above mean tide level.

This extraordinary rainfall was confined within narrow limits. There was but one standard rain gauge within a radius of twenty-five miles; there were, however, rough measurements made in the immediate neighbourhood, which tallied closely with the record of Mr. Plummer. On a farm about three miles to the south-west a half barrel, with a depth of about 15 or 16 inches, which was empty before the rain, was completely filled by the rain. Making due allowance for the difference in diameter between top and base, the rainfall must have exceeded 12 inches. At another point distant about two miles some milk cans, with a depth of about 12 inches, were filled to overflowing. The top diameter of these cans was less than that of the base; which again would indicate a rainfall exceeding 12 inches. The roads in the vicinity of Jewell were gullied in places to the depth of 4 and 5 feet by the rain. The lowlands were flooded, crops were destroyed and fences were carried away. The level of Lyons Creek was higher than it had ever been observed before.

The daily weather maps of the United States Weather Bureau for July 26th, 27th and 28th show an irregular and shallow area of low

pressure, nearly stationary over the Lower Lake Region and Middle Atlantic States, together with much cloudiness and rain. Pressure areas over the entire country were much broken up, with but slight differences between the highest and lowest barometer readings. At 8 p.m. of the 26th, during the time of heaviest precipitation, the lowest pressure was recorded at Cleveland, Ohio, 29·68 inches, bringing Jewell within the south-east quadrant of the storm area, and about 500 miles from the centre. The barometer was highest (30·10 inches) over the New England States to the north-east, and in Missouri (30·00 inches) to the south-west. At Baltimore, Philadelphia and Washington the prevailing winds were from the east and north-east on the 26th, 27th and 28th. During these days rain fell to the depth of over 3 inches at the following stations in the eastern portions of Maryland and Pennsylvania :—

MARYLAND.

Stations.	Amt. in inches.
Annapolis	3·15
Baltimore	3·10
Fallston	3·65
Frederick	3·07
Jewell	14·75
Solomons	3·84
Taneytown	3·38
Van Bibber	3·75

PENNSYLVANIA.

Stations.	Amt. in inches.
Browers Lock	3·06
Dyberry	4·45
Honesdale	3·22
Philadelphia	3·70
Pottstown	3·34
Reading	3·15
Shawmont	3·39

O. L. F[ASSIG].

THE GLOOMY SUMMERS OF 1860 AND 1879, AND THE 19 YEARS' CYCLE.

To the Editor of the Meteorological Magazine.

SIR,—A misprint remained uncorrected, probably by my own fault, in the letter on page 57 of your May number.

The first line of the fourth paragraph ought to have run—as is fairly evident from what follows—"Thus, before 1860 there came the three brilliant summers of 1857, 1858 and 1859."

There can be no doubt that May, 1898, has followed very closely indeed the patterns set by May, 1860, and May, 1879. Whether the coming months will be equally obsequious, remains to be seen. If 1879 is to be followed *in detail*, we shall get no respite at all from gloom and moisture, and may look for some severe thunderstorms. Vide *Meteorological Magazine* and *British Rainfall* for that year, which most of your readers will have. N.B.—The references in these to 1860 will be found to be very numerous.

But if 1860 be followed *in detail*, the first half of July should be fine. A cartoon will be found in a *Punch* of that date in which Britannia or somebody is greeting a rising sun with the exclamation, "Why, Mr. Phœbus, where *have* you been all this time?"

But *Punch* was premature, and Mr. Phœbus took offence, and St. Swithin came with his watering-pot, and used it with such effect

that there was, in Rutland, hay ungathered in November, and snow on the beans!

A long and very severe winter followed both in 1860 and 1879.

I am, yours truly, H. A. BOYS.

North Cadbury Rectory, June 1st, 1898.

SIR,—As the subject of cycles is now under consideration (*vide* Mr. Boys' letter in the current number of your *Magazine*) the following extract may possibly be of interest to those of your readers to whom it is unknown. It is from Bacon's essay "Of Vicissitude of Things," and is as follows:—"They say it is observed in the Low Countries (I know not in what part), that every five-and-thirty years the same kind and suit of years and weathers comes about again; as, great frosts, great wet, great droughts, warm winters, summers with little heat, and the like; and they call it the prime; it is a thing I do the rather mention, because, computing backwards, I have found some concurrence."—Yours faithfully, G. E. E.

Wealdstone, R.S.O., Middlesex, May 22nd, 1898.

[It is impossible for us to print a tenth of the comments which Mr. Boys' letter has elicited, and we think that it will be better to defer further publication until our August or September number. But it may not be amiss to point out that it is a 19-years' cycle for which Mr. H. C. Russell pleads,* and in working on our Meteorological Catalogue we have just come upon the following card:—

RASPAIL, François Vincent.

Prévision du temps. Almanach et Calendrier Météorologique pour l'année 1865, suivi d'un Traité succinct sur l'art de prognostiquer le temps avec un certain probabilité.

(*Based upon the idea that the weather repeats itself every 19th year.*)

16mo. **Paris [1864]**

On reading one of our own copies of Raspail's Almanach, that for 1868, we are amused to see that this 19-years' theory dates back more than a century. Here is the paragraph *verbatim et literatim* (because one date † is certainly wrong):—

"Grand Jean de Fouchy, de l'Observatoire de Paris, ayant signalé, en 1674 [1774], à l'abbé L. Cotte, les rapports de

* *Met. Mag.*, 1897, p. 40.

† Grand-Jean de Fouchy was not born till 1707, and Cotte not till 1740.

la période lunaire de dix-neuf ans, avec le retour, an par an, des mèmes phénomènes de température moyenne, ce dernier s'appliqua à verifier cette donnée sur la série des observations météorologiques que l'Observatoire mit à sa disposition ; et il en dressa un tableau pour chaque année, à partir de 1805 jusqu'en 1898 inclusivement. C'est de ce travail que nous avons extrait ce qui concerne l'année 1868."

So also the interesting note by G. E. E. shows that Bacon had examined the 35 year period, of which apparently Dr. Brückner * (nearly 250 years afterwards) had not heard when he adopted 34 years and 10 months.

It is not very easy to see how 19 years and 35 years can both be well founded.]

REVIEW.

Weather Lore: a collection of Proverbs, Sayings and Rules concerning the Weather, compiled and arranged by RICHARD INWARDS, F.R.A.S. 3rd edition, revised and augmented. London: Elliot Stock. Large 8vo, 1898, xii.–234 pages, 1 plate.

WE spoke highly (*Met. Mag.*, Vol. XXVIII., p. 169) of the second edition of this work, and yet the present is undoubtedly considerably better. The frontispiece, giving reproductions of ten good photographs of clouds, superposed in the order of elevation which has been assigned to them, is original and effective.

The text has been thoroughly examined, and largely increased ; in fact, it would not be bad practice if all who have any collection of weather proverbs would go through them, and compare them with Mr. Inwards's book. If they find any *not* in *Weather Lore*, they should send them on to Mr. Inwards in readiness for his 4th edition. Unless they dive into early Latin authors like Fabritius of Padua, we do not think that they will have many to send, for the collection is now very large. Mr. Inwards does not say how many proverbs there are, but a rough calculation gives 3500 !

Two features of the book are of exceptional excellence, and show plainly that the author has not shrunk from work. The bibliography contains references to 154 books and articles, and the index occupies double columns on 20 pages.

Apparently Mr. Inwards was hurried while revising the bibliography, for though we have noticed only "mantel" for "mantle" in the first 200 pages, we have, on page 208 Chiswick for Criswick ; on 209, "Dr. M. G. Hellmann" for "Dr. G. Hellmann," and on 210, "M. A. Pointer" for "J. Pointer." It would be well if all volumes were as correctly printed.

---

* See *Met. Mag.*, Vol. XXV., 1890, pp. 170-171 and 183.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	55·9	16	23·7	26	45·5	35·7	37·3	87	66·9	21·2	2·20	17	6·4
Malta	66·5	4	45·6	20	60·7	51·6	48·0	79	130·2	40·3	3·97	20	6·8
Cape of Good Hope	87·6	31	49·7	26	76·7	58·9	55·8	66	...	...	·56	4	3·0
Mauritius	86·6	8	70·1	8	84·4	74·7	71·1	78	134·8	66·1	4·53	18	6·6
Calcutta	78·9	28	49·0	17	75·7	55·8	53·7	66	136·0	39·2	·00	0	1·7
Bombay	89·1	20	66·0	28	84·6	68·7	62·8	65	134·1	54·0	·00	0	0·4
Ceylon, Colombo	90·2	1	71·5	8	86·3	73·2	72·4	84	149·0	68·0	8·89	13	6·8
Melbourne	107·3	30	48·2	11	80·3	57·6	52·1	61	157·9	38·5	2·20	5	4·2
Adelaide	110·8	16*a*	45·9	3	90·8	64·0	49·3	38	166·3	35·0	·03	2	2·4
Sydney	87·1	17	57·8	12	74·9	63·9	59·3	70	149·0	53·2	5·31	16	6·0
Wellington	76·8	24	42·0	2	66·6	51·9	48·8	69	135·0	34·0	·73	7	3·8
Auckland	77·0	27	46·0	28	70·0	55·9	53·5	72	137·0	43·0	·13	5	4·4
Jamaica, Kingston	91·3	16*b*	67·7	23	88·6	69·7	66·6	74	...	...	·09	3	2·0
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	87·4	15	69·2	4	82·4	73·0	70·0	79	148·4	...	11·92	19	2·1
Toronto	54·2	10	−5·3	24	33·9	20·8	26·2	84	64·5	−11·0	3·66	17	8·3
New Brunswick, Fredericton	53·8	15	−10·7	4	30·6	13·8	15·8	75	...	...	3·14	11	6·4
Manitoba, Winnipeg	32·8	9	−28·0	18	13·6	−5·9	...	...	...	...	·55	9	5·8
British Columbia, Esquimalt	51·8	5	28·9	15	44·1	37·7	39·1	93	...	...	10·84	22	8·8

a—and 28. *b*—and 17.

REMARKS.

MALTA.—Mean temp. 55°·3, or 0°·9 below average. Mean hourly velocity of wind 11·0 miles, or 0·1 below average. L on 4 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 2°·0 above, of dew point 3°·1 above, and rainfall ·44 in. below, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·5 above average; extremes, 71·0 on 5th and 1·7 on 11th and 27th. Prevailing direction E. to E. by N. L on 3 days and T and L on 24th. The mean of the rainfall at 32 stations was 50 per cent. above the average for December. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. 78°·5 or 0°·6 below, mean dew point 1°·6 above, and rainfall 2·40 in. above, their respective averages. Mean hourly velocity of wind 9·8 miles; prevailing direction N.N.E. T on 4 days, but no L. H. O. BARNARD.

Adelaide.—The hottest month on record, the mean temp. being 6°·4 above the average for 40 years; there were 17 days when the temp. reached 90° in the shade (greatest number previously being 15), and 9 were over 100°. R ·83 in. below the average. C. TODD, F.R.S.

Sydney.—Temp. 0°·5 below, humidity 1 above, and rainfall 2·66 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Light showers and generally fine, bright weather, though strong winds prevailed from N.W. Earthshocks on 8th and 27th. Rainfall 3·08 in. below, and mean temp. 1°·6 below, the average. R. B. GORE.

Auckland.—The driest December on record. Mean temp. rather under the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Average hourly velocity of wind 1·7 miles. Rainfall one-twentieth of the average; Island rainfall three-fifths of the average. Shock of earthquake on 14th. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1898.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·38	XI.	Builth, Abergwesyn Vic.	5·66
II.	Dorking, Abinger Hall .	3·79	,,	Rhayader, Nantgwillt ...	4·82
,,	Birchington, Thor	3·17	,,	Lake Vyrnwy	6·27
,,	Hailsham	3·69	,,	Corwen, Rhug	3·59
,,	Ryde, Thornbrough	3·72	,,	Criccieth, Talarvor	4·45
,,	Emsworth, Redlands ...	3·38	,,	I. of Man, Douglas	3·51
,,	Alton, Ashdell	3·60	XII.	Stoneykirk, Ardwell Ho.	2·46
III.	Oxford, Magdalen Col..	2·38	,,	New Galloway, Glenlee	2·70
,,	Banbury, Bloxham	3·13	,,	Moniaive, Maxwelton Ho.	3·20
,,	Northampton, Sedgebrook	3·90	,,	Lilliesleaf, Riddell	1·59
,,	Duddington [Stamford].	2·74	XIII.	N. Esk Res. [Penicuick]	2·90
,,	Alconbury	3·26	XIV.	Glasgow, Queen's Park..	2·04
,,	Wisbech, Bank House...	2·71	XV.	Inverary, Newtown	2·75
IV.	Southend	2·62	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	2·91	,,	Islay, Gruinart School ...	1·92
,,	Colchester, Lexden	2·85	XVI.	Dollar.....	2·60
,,	Rendlesham Hall	1·90	,,	Balquhidder, Stronvar...	2·67
,,	Rushall Vicarage	3·21	,,	Ballinluig	...
,,	Swaffham	3·15	,,	Dalnaspidal H.R.S.....	3·62
V.	Salisbury, Alderbury ...	4·68	XVII.	Keith H.R.S.....	3·41
,,	Bishop's Cannings	3·20	,,	Forres H.R.S.	2·44
,,	Blandford, Whatcombe .	3·83	XVIII.	Fearn, Lower Pitkerrie..	2·02
,,	Ashburton, Holne Vic...	4·48	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	4·88	,,	Invergarry	1·58
,,	Hartland Abbey	4·76	,,	Aviemore H.R.S.	1·90
,,	Lynton, Glenthorne ...	4·37	,,	Loch Ness, Drumnadrochit	2·61
,,	Probus, Lamellyn	4·17	XIX.	Invershin	4·72
,,	Wellington, The Avenue	4·02	,,	Durness	...
,,	North Cadbury Rectory	3·32	,,	Watten H.R.S.....	3·44
VI.	Clifton, Pembroke Road	3·40	XX.	Dunmanway, Coolkelure	3·44
,,	Ross, The Graig	3·85	,,	Cork, Wellesley Terrace	2·24
,,	Wem, Clive Vicarage ...	3·88	,,	Killarney, Woodlawn ...	2·99
,,	Wolverhampton, Tettenhall	3·42	,,	Caher, Duneske	2·75
,,	Cheadle, The Heath Ho.	3·85	,,	Ballingarry, Hazelfort...	2·83
,,	Coventry, Priory Row ..	2·70	,,	Limerick, Kilcornan ...	3·36
VII.	Grantham, Stainby	3·15	,,	Broadford, Hurdlestown	...
,,	Horncastle, Bucknall ...	1·78	,,	Miltown Malbay	3·36
,,	Worksop, Hodsck Priory	2·12	XXI.	Gorey, Courtown House	3·42
VIII.	Neston, Hinderton	4·00	,,	Athlone, Twyford	3·09
,,	Southport, Hesketh Park	3·26	,,	Mullingar, Belvedere ...	4·41
,,	Chatburn, Middlewood.	3·38	,,	Longford, Currygrane...	4·00
IX.	Melmerby, Baldersby ...	1·88	XXII.	Woodlawn	3·59
,,	Scarborough, Observat'y	2·54	,,	Crossmolina, Enniscoe ..	3·56
,,	Middleton, Mickleton ...	2·11	,,	Collooney, Markree Obs.	4·35
X.	Haltwhistle, Unthank...	2·70	,,	Ballinamore, Lawderdale	3·16
,,	Bamburgh	1·95	XXIII.	Warrenpoint.....	3·20
,,	Duddon Valley, Ulpha School	4·53	,,	Seaforde..	3·02
,,	Keswick, The Bank.....	3·17	,,	Belfast, Springfield	3·85
XI.	Llanfrechfa Grange	3·37	,,	Bushmills, Dundarave..	2·49
,,	Llandovery	4·06	,,	Stewartstown	3·30
,,	Castle Malgwyn	5·32	,,	Killybegs	5·88
,,	Brecknock, The Barracks	3·90	,,	Horn Head	3·96

MAY, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·26	+ ·36	·46	19	21	75·2	23	34·6	13	0	1
II.		Tenterden	3·40	+ 1·84	·68	13	18	74·0	23	35·0	13	0	4
,,		Hartley Wintney	2·76	...	·38	23	25	78·0	23	...	...	...	...
III.		Hitchin	2·82	+ ·87	·60	20	22	73·0	23	35·0	12	0	...
,,		Winslow (Addington)	3·37	+ 1·27	·64	20	22	72·0	23	32·0	13	1	3
IV.		Bury St. Edmunds (Westley)	2·84	+ 1·09	·31	1	19	67·0	24	36·0	13	0	...
,,		Norwich (Brundall)	2·78	...	·41	10	19	66·2	23	33·4	15	0	6
V.		Winterbourne Steepleton ...	3·56	...	·55	20	19	71·0	23	33·5	17	0	6
,,		Torquay (Cary Green)	3·17	...	·48	20	17	66·5	23	39·5	17	0	0
,,		Polapit Tamar [Launceston]..	4·36	+ 2·53	1·21	2	19	70·4	23	33·5	17	0	2
VI.		Stroud (Upfield)	3·32	+ 1·28	·44	20	22	72·0	23	38·0	12	0	...
,,		ChurchStretton(Woolstaston)	5·41	+ 2·54	1·61	23	20	68·0	29	33·5	19	0	3
,,		Worcester (Diglis Lock)	4·00	+ 1·72	1·09	20	22	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·66	...	·60	20	23	...	...	...	...	...	...
,,		Boston	2·41	+ ·69	·38	5	17	75·0	22	33·0	2	0	...
,,		Hesley Hall [Tickhill].....	1·70	— ·34	·45	20	19	69·0	23	34·0	18*e*	0	...
VIII.		Manchester(PlymouthGrove)	2·81	+ ·46	·63	10	17	70·0	22	36·0	12	0	1
IX.		Wetherby (Ribston Hall) ...	2·61	+ ·66	1·10	20	10	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·49	— ·23	1·17	10	14	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·82	— ·06	·47	20	15	64·0	22	34·0	18*e*	0	6
X.		Newcastle (Town Moor)	2·20	+ ·45	·66	21	12	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	6·90	— 1·71	2·26	10	21	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	3·29	+ ·44	·45	23	20	...	...	...	...	...	...
,,		Haverfordwest	4·11	+ 1·75	1·19	2	19	70·6	23	34·8	7	0	16
,,		Aberystwith (Gogerddan) ...	3·99	...	·92	10	15	74·0	23	...	...	...	...
,,		Llandudno.....	5·16	+ 3·23	·72	22	20	67·0	24	40·0	2, 15	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·08	+ ·56	·84	10	10	67·0	24	30·0	16	3	...
XIII.		Edinburgh (Blacket Place)...	2·34	...	·57	2	18	65·1	7	33·8	18	0	4
XIV.		Colmonell	3·19	...	·99	10	16	71·0	24	29·0	13	...	...
XV.		Tighnabruaich	4·01	...	·72	10	17	64·0	20*a*	33·0	13*f*	0	...
,,		Mull (Quinish).....	2·76	— ·19	·46	10	20	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·20	— ·36	·50	3	10	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·95	+ ·29	·65	10	10	66·9	28	31·8	18	1	...
XVII.		Braemar	2·02	— ·39	·32	2	21	62·0	23	27·8	20	9	22
,,		Aberdeen (Cranford)	3·10	...	·88	2	19	65·0	8	30·0	17*g*	5	...
,,		Cawdor (Budgate)	2·77	+ 1·02	·57	31	18	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	3·71	+ ·62	·54	3	13	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·18	...	1·11	31	23	62·0	19*b*	29·5	14	2	...
XIX.		Dunrobin	3·36	+ 1·26	·85	10	18	58·8	7	32·0	16	1	...
,,		S. Ronaldshay (Roeberry) ...	5·27	+ 3·55	1·61	31	21	59·0	18	32·0	12*f*	2	...
XX.	IRELAND.	Darrynane Abbey.....	2·77	...	·80	2	19	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·47	+ ·24	·67	2	18	69·5	25	33·0	15	0	...
,,		O'Briensbridge (Ross)	2·67	...	·46	3	18	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·34	+ 1·00	·88	2	19	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·33	+ 1·40	·67	2	20	63·7	8, 25	36·0	16	0	0
XXII.		Ballinasloe	2·83	+ ·14	·47	2	20	65·0	22*c*	36·0	14*f*	0	...
,,		Clifden (Kylemore)	4·09	...	·63	2	19	...	...	...	...	...	...
XXIII		Waringstown	3·63	+ 1·19	·70	13	20	69·0	20*d*	33·0	15	0	7
,,		Londonderry (Creggan Res.).	3·73	+ 1·21	·45	16	21	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·26	+ ·79	·67	7	20	70·0	24	32·0	12*f*	2	3

+ Shows that the fall was above the average ; — that it was below it.

a—and 21, 24, 25. *b*—and 20. *c*—and 24. *d*—and 21. *e*—and 27. *f*—and 15. *g*—and 18.

METEOROLOGICAL NOTES ON MAY, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

TENTERDEN.—The wettest May in 35 years, except 1878 and 1879; the only others with more than 3·00 in. being 1865, 1872 and 1891. The fourth week, however, was dry, with two days with temp. above 70°, but only 11 days were over 60°. Great abundance of blossom on trees and shrubs. The oak in leaf decidedly before the ash. Duration of sunshine 148 hours. Distant T on 23rd.

HARTLEY WINTNEY.—Wet, cold and ungenial, with no two consecutive rainless days. A short severe TS occurred at midday on 23rd, the L striking three trees and killing sheep; R only ·12 in. L also on 15th and 22nd, and a distant TS on 31st. Mean max. temp. 64°·2, mean min. 39°·0. Ozone on 27 days. Oak in leaf on 12th; hawthorn in flower on 14th; ash in leaf on 30th.

ADDINGTON.—Cold and wet, the number of rainy days having been exceeded only once in 27 years, in 1878. Only one day with temp. above 70°. H storm, covering the ground, on 13th. Sharp TS at 5 p.m. on 22nd.

BURY ST. EDMUNDS, WESTLEY.—Cold and rainy, with little sunshine. TS on 3rd; distant T on 12th and 31st.

NORWICH, BRUNDALL.—A showery month, with a remarkable absence of really warm days. Mean temp. 50°·3. Rainfall ·96 in. in excess of the average. Gale from E. on 19th. Distant T and L at 8 p.m. on 20th. Solar halo on 27th.

WINTERBOURNE STEEPLETON.—Unusually wet and apparently cold, though the mean temp. was not much below the average; but the days were much colder than the nights, comparatively. Mean max. 57°·7, or 4°·0 below, mean min. 44°·0, or 2°·1 above, the average of 5 years. The R was gentle, and when much fell it was continuous.

TORQUAY, CARY GREEN.—Rainfall 1·49 in. above, the average of 22 years. Mean temp. 0°·7, below the average. Duration of sunshine 170 hours, being 61 hours 20 mins. below the average; five sunless days.

POLAPIT TAMAR.—The wettest May for 20 years. A very heavy TS occurred on 2nd, accompanied by vivid L and torrents of R between 10.15 a.m. and 10.45 a.m., ·65 in. falling in 35 minutes; it was very dark and sultry during the storm, with absolute calm. Another TS occurred on 22nd, lasting only 10 minutes, when ·30 in. of R fell, with some half-melted H. The end of the month was finer, but with cold wind, generally northerly.

WOOLSTASTON.—A cold, backward month. A violent storm of T and L with heavy R occurred on 22nd, from 4.30 to 5.30 p.m., ·75 in. of R falling in the hour. On the following day a TS of unexampled severity raged from 7.15 to 8.35 p.m. R came down in sheets, 1·38 in. falling in an hour and 20 minutes. The roads were converted into foaming torrents, and were quite impassable. The damage and destruction were very great. Mean temp. 51°·5.

WALES.

HAVERFORDWEST.—The month commenced with storm and excess of R, ·89 in. falling in 5 hours on 2nd; broken weather generally prevailed until 22nd, when it culminated in a TS, severe to the E., but only slight over Haverfordwest. Fine weather set in after 22nd, with an increase of temp. and sunshine. Mean temp. below the average, and an unusual number of low grass readings. Crops looking well.

SCOTLAND.

CARGEN [DUMFRIES].—Cold, cloudy and changeable weather. The mean temp., 49°, is only 4°·5 higher than that of January, and the mean on 17th, 39°, was lower on only one day (10th) of that month. The R is above the average, and there was considerably less sunshine than usual. E. winds continued without interruption for 10 days (18th to 27th), during which period only ·36 in. of R fell, and pastures and hay crops made little progress. The ash was bursting into leaf at the close, reversing its position as compared with the oak, experienced last year. T with H showers on 31st. On 11th the bar. fell to 28·820 in., the lowest in May since observations began in 1860.

EDINBURGH, BLACKET PLACE.—Mean temp. 1°·3 below the average. Sunshine, humidity and rainfall normal. T and L on 3rd; H and L on 4th; Sleet and H on 31st. On 11th the bar. fell to 28·836 in., the lowest in May for 20 years.

COLMONELL.—Rainfall ·79 in. above, and mean temp. 1°·0 below, the average of 22 years.

TIGHNABRUAICH.—Rainfall normal. Mean temp. 1° lower than last year.

ABERDEEN, CRANFORD.—Cold, with little sunshine and N. and N.W. winds.

S. RONALDSHAY, ROEBERRY.—A very wet month; the wettest in 32 years, the rainfall being more than thrice the average of 31 years. The next wettest May was in 1892, when 3·68 in. fell. Mean temp. 45°·6, or 2°·0 below the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—Very cold, except from 18th to 25th, and the end of the month dry. Rainfall about the average.

WATERFORD, BROOK LODGE.—Weather very unsettled. L at night on 24th. Distant T in E. from 11 a.m. to 2 p.m. on 25th. H showers on 13th and 30th.

O'BRIENSBRIDGE, ROSS.—Rather cold, and many sunless days, but vegetation fairly good.

DUBLIN, FITZWILLIAM SQUARE.—A cloudy, rainy, showery and cold month. A remarkable preponderance of polar winds. Mean temp. 51°·2, or 0°·8 below the average. High winds on 9 days. H on 5 days. T and L on evening of 23rd. Lunar halo on 4th; solar halos on 8th and 11th.

OMAGH, EDENFEL.—Unsettled and gloomy, with temp. somewhat below, and rainfall considerably above, the average; and it cannot be said that the weather in either of these respects improved as the month progressed—in fact, the mean temps. of May 31st and June 1st were identical with those of Christmas Day and December 26th last, and appreciably lower than that of many days in January. No damage, however, has as yet accrued to vegetation that a seasonable period would not more than redress.

No. CCCXC.]
VOL. XXXIII.

[PRICE FOURPENCE.
Or 5s. per annum post free.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

PAGE
The International Aëronautical Conference at Strasburg 81
Scientific Balloon Ascents 84
Floods and Storms in South Africa 85
REVIEWS:
Science Progress 87
Wragge's Australasian Weather Guide and Almanac for 1898. 87
Earthquakes and other Earth Movements 88
Publications of the Royal Alfred Observatory, Mauritius 89
The Fifth International Congress of Hydrology, Climatology and Geology 89
Results of Meteorological Observations at Camden Square for June for 40 years, 1858–97 91
Climatological Table for the British Empire, January, 1898 ... 92
Supplementary Table of Rainfall, June, 1898 93
Rainfall and Temperature in June, 1898, at 50 Stations 94
Meteorological Notes on June, 1898 95

JULY, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: J. E. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXC.] JULY, 1898. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE INTERNATIONAL AËRONAUTICAL CONFERENCE AT STRASBURG.

(Reprinted from *Science*, New York, June 24th, 1898).

THE meeting, ten weeks ago, of the International Aëronautical Committee, appointed by the Paris Meteorological Conference of 1896, was noteworthy in two respects. First, it marked the beginning of a new era in meteorological investigation, as shown by an organised effort to cut loose from observatories on the earth, and to study the conditions of the free air; and, second, by the assembling at Strasburg of French and Germans, political questions were held to be subservient to the conquest of the high atmosphere, and the extension of the common realm of science. Official and private hospitality was abundant, and the utmost good fellowship prevailed among the members of the Committee and the other meteorologists, physicists, and aëronauts who were present by invitation. It was regretted, although hardly a surprise, that there was no one from Great Britain, where, since Glaisher's remarkable balloon ascension, little has been done to explore the free air. The following named members of the Committee were in attendance :—

Professor Hergesell, *President*, of Strasburg.
MM. de Fonvielle, *Secretary*, Cailletet and Besançon, of Paris.
Drs. Assmann and Berson, of Berlin.
Professor Erk, of Munich.
General-Major Rykatcheff and Colonel Kowanko, of St. Petersburg.
Mr. Rotch, of Boston, United States.

The methods discussed for obtaining observations in the free air were: balloons with aëronauts; *ballons-sondes*, or unmanned balloons to carry self-recording instruments to the height of ten miles or more; and, for observations within a mile or two of the earth, the captive kite-balloon, and kites with self-recording instruments. Aside from technical details, the most important decisions concerning balloons related to the measurements of the height reached, and of the air temperature around them. Although, for the determination of height,

from observations in the balloon, the mercurial barometer must be considered as the standard, yet its indications are only accurate when the balloon has no vertical velocity. If aneroids are used they should be compared frequently with the standard, and, as far as possible, under actual conditions. It was decided that for the calculation of height, the barometric observations should be reduced everywhere by the same method, whatever that might be ultimately. M. Cailletet described his apparatus for photographing automatically at fixed intervals of time, a barometer in the balloon and the ground vertically below, so that the barometric heights can be calculated, and from a map the true heights, and the route of the balloon may be determined. This apparatus was recommended for use with both manned and unmanned balloons. On account of the rapid changes of temperature, it was recognised that very sensitive thermometers must be employed in *ballons sondes*, and that their artificial ventilation is essential. M. Cailletet exhibited a thermometer having a spiral silver tube for its bulb soldered to a glass tube, both being filled with the liquid toluene. This thermometer is extremely sensitive. M. Teisserenc de Bort showed a very sensitive self-recording thermometer which is, at the same time, almost insensible to shocks. It is composed of a blade of German silver set in a frame of invariable steel, and can be ventilated in a *ballon-sonde* by a fan turned by a weight attached to a long wire. For the determination of the temperature of the air around manned balloons, the proper instrument to employ is Assmann's aspiration thermometer, hung at least five feet outside the basket, but simultaneous comparisons with the sling thermometer were advised. The self-recording instruments carried in manned and unmanned balloons should be verified in pneumatic and refrigerating cabinets, under such changes of pressure and temperature as might occur in the atmosphere.

Prof. Hergesell and Dr. Berson urged the importance of simultaneous balloon ascents in the different countries when there was a barometric depression over the European continent. From a meteorological standpoint the manned ascents have an importance which the *ballons-sondes* do not possess, because the temperature of the highest atmosphere has no influence on the meteorological elements near the surface of the earth. M. de Fonvielle, however, called attention to the interest which thermometric measurements at a very high altitude would offer for the determination of the temperature of planetary space. These measures might enable us to choose between the kinetic theory of gases, which assumes the temperature of 273° Centigrade below zero, and Fourier's hypothesis, that the temperature of space is near that of the minima observed in the polar regions of the earth.

It was agreed that the fifth international ascent of *ballons-sondes* should take place early in June, and manned or unmanned ascents were promised in Austria, Belgium, and Italy, in addition to those in Germany, France, and Russia, which countries had already co-

operated. On the day designated, observations at the mountain stations, as well as with kites and captive balloons, will serve for the simultaneous study of the lower air.

Mr. Rotch read a report, which he had been asked to prepare, on the use of kites for meteorological observations, based on the experiments carried on at Blue Hill Observatory for several years past. The advantages which kites have over balloons up to a height of at least 10,000 feet, whenever there is wind, were pointed out. It was reported that, besides their use in the United States, kites were being employed to obtain meteorological records at St. Petersburg and near Paris. M. Tacchini proposes to try them on Mounts Cimone and Etna, and Professor Hann hopes to obtain data in this way above the Sonnblick, the highest permanently occupied observatory in Europe. The Conference recommended kites as being of great value to meteorology, and desired that they should be used at the chief observatories, together with the kite-balloon (described hereafter), for continuous observations. The Committee was enlarged by the addition of the following persons: M. Teisserenc de Bort and Prince Roland Bonaparte, of Paris; Professor Hildebrandsson, of Upsala; Professor Pernter and Lieutenant Hinterstoisser, of Vienna; Captain Moedebeck, of Strasburg; and Lieutenant von Siegsfeld, of Berlin. The next meeting will be at Paris in 1900.

During the Conference there were two trials of the kite-balloon—a captive balloon which, unlike the ordinary spherical one, is not driven down or carried away by strong winds. It is the invention of Lieutenants von Parseval and von Siegsfeld, of the German army, where it is used for reconnoitering, but the smaller Strasburg balloon, constructed by M. Riedinger, of Augsburg, for Professor Hergesell and Captain Moedebeck, is the first to lift self-recording meteorological instruments. It consists essentially of a cylinder of varnished linen, having a volume of 7,770 cubic feet, so attached to the cable that its upper end is inclined towards the wind, which thus tends to raise the balloon. The cylindrical form is preserved, notwithstanding leakage of gas, by admitting wind into an auxiliary envelope at the rear end, which also serves as a rudder, stability about the axis being secured by lateral wings. The instruments are contained in a basket, with open ends, hung far below the balloon. The azimuth, angular altitude and traction of the cable are recorded continuously by an ingenious dynamometer. In spite of unfavourable weather and gas of insufficient lifting power, the experiments were fairly successful, and previously the balloon had been maintained during several days above the city.

The Committee also witnessed an ascent of the *ballon-sonde*, "Langenburg," carrying self-recording instruments. This silk balloon, when inflated with 14,000 cubic feet of coal gas, had an initial lifting force of 440 pounds in excess of its load. Owing to a premature start the ballast was left behind, and the sudden plunge upward not only emptied some of the gas, but stopped the clock

movements of the thermographs. The ascent was made in the late afternoon, and the balloon, which soon disappeared in the clouds, was found the next day about sixty miles south-east of Strassburg, having risen more than six miles, as was determined from its barometric record.

A. LAWRENCE ROTCH.

SCIENTIFIC BALLOON ASCENTS.

(From the *Times* correspondent).

PARIS, *June 8th.*

THREE balloons were sent up from La Villette this morning, as arranged at the recent Aeronauts' Conference at Strasburg. The first, measuring only 1,200 cubic feet, was sent up at 2.30 a.m. for the purpose of registering the temperature of the air before sunrise. This operation had but few spectators, whereas the two later ascents attracted about 500 persons belonging to scientific, aeronautic, and Press circles, including the Prince of Monaco and a large number of ladies, as also several members of the United States Legation, now naturally interested in ballooning.

The second balloon, measuring 14,000 cubic feet, was sent up at nine o'clock. The Prince of Monaco cut the rope attaching it to the ground. The car of the balloon contained various instruments, including a baro-thermometer by Richard, another by M. Teisserenc de Bort, director of the Trappes Observatory, a registering actinometer by M. Viollet, of the Institute, and an automatic photographic camera by M. Cailletet, taking, at five minute intervals, 20 views of the surface at the nadir of the balloon, whether land, sea, or cloud. Nothing was seen of the balloon from the top of the Tour St. Jacques, whence observations were to have been taken by M. Jaubert, director of the municipal meteorological department, and a like disappointment awaited M. Secretan on the top of the Eiffel Tower. Persons who had assembled in the grounds of the gas company watched the balloon, but only for eight minutes. It then disappeared in the clouds which were passing at an altitude of 4,000 or 5,000 feet. This shows a mean velocity of somewhat less than 10 feet per second, and indicates that the French balloon could not reach an altitude of 45,000 feet, as on former occasions, but will hardly reach 30,000 feet, owing to the increased weight of scientific instruments. When it passed out of sight it was travelling in the direction of the North Sea, but it is expected that the strong westerly wind always blowing in high altitudes above the loftiest mountains will send it eastwards. At 9.30 a slight rain set in and continued for some hours. The wind was very moderate and varied in direction.

The ascent of the Balachoff, which was sent up with an aeronaut and with M. Hermite, was a very easy and picturesque one. The car was full of scientific apparatus, so that the occupants had scanty elbow room. There were two large baskets containing Violett's registering actinometers in order to determine by accurate measurements the intensity of solar radiation.

To-day is St. Médard's, the French St. Swithin's, and many people will expect 40 days' consecutive rain, but what is certain is that to-day was

unfavourable for the balloons. Berlin, Munich, Vienna, Strasburg, Warsaw, Brussels, and Rome may perhaps have had better luck for their simultaneous ascents. The aerial district thus constituted to-day covers about 1,200 miles in longitude and as many in latitude, or 12 to 14 times the extent of England and Wales. This is the most extensive scientific operation on record, and the non-participation of England is much regretted, especially as Glaisher was one of the creators of scientific aeronautics. The collection and discussion of the observations will, of course, take some little time.

FLOODS AND STORMS IN SOUTH AFRICA.

To the Editor of the Meteorological Magazine.

SIR,—Having noticed in your Magazine for April an article on "Floods and Storms in South Africa," I thought you might be interested in the details of the rainfall all over the Colony during the month of January last. I have accordingly sent you by the same mail a complete list of the Stations, giving the amount of rainfall during that month as well as the number of "days on which rain fell."—I am, Sir, yours faithfully,

CHARLES STEWART,
Secretary.

Meteorological Commission, Cape Town, May 4th, 1898.

[WE are glad to be favoured with Mr. Stewart's letter and table, especially as the latter affords evidence of the remarkable development of rainfall work in South Africa. It is very much too long to print *in extenso*, and we have, therefore, prepared the following abstract, which not merely gives all the monthly totals which exceeded 12 inches, but also the largest in each Division and the total number of stations in it, thus giving full details as to the strength of the observing staff in South Africa.

Division.	Name.	No. of Stations.	Greatest Total, and Totals exceeding 12 in., for January, 1898.	
I.	Cape Peninsula	29	St. Michael's, Table Mountain	2·39
II.	South-West	24	Houw Hoek	3·80
III.	West Coast	15	Piquetberg	·85
IV.	South Coast	31	Concordia	7·20
V.	Southern Karroo	9	Glenconnor	3·99
VI.	West-Central Karroo	13	Camfer's Kraal	4·74
VII.	East-Central Karroo	23	Somerset East	9·65
VIII.	Northern Karroo	39	Colesberg	10·05
IX.	Northern Border	17	Groot Boetsaap, 13·77; Bell's Bank	13·23
X.	South-East	49	Evelyn Valley, 15·95; Katberg, 13·25; Thaba N'doda	12·88
XI.	North-East	27	Barkly East, Avoca, 18·09; Palmeitfontein, 17·15; Glen Lyon, 16·48; Herschel, 16·41; Lady Grey, 15·92; Gateshead, 14·45; Barkly East, 12·95; Aliwal North	12·17

Division.	Name.	No. of Stations.	Greatest Total, and Totals exceeding 12 in., for January, 1898.	
XII.	Kaffraria	18	Woodcliff, 18·66; Maclear, 14·82; Engcobo	12·57
XIII.	Basutoland	5	Mafeting, 21·78; Moyeni, 19·71; Leribe, 16·35; Butha Butha	14·80
XIV.	*Orange Free State	1	Philipolis	9·16
XV.	*Natal	47	Impendhle, 15·20; Umzinto, 13·62; Nottingham Road, 13·56; Polela, 13·22; Pietermaritzburgh (Bush Valley), 12·29; Everdon (Howick)	12·16
XVI.	South African Republic	3	Bremersdoon	17·10
XVII.	Bechuanaland	4	Taung	7·80
XVIII.	Rhodesia	2	Hope Fountain	7·75

From the above we see that there are now more than 300 rainfall stations reporting to the Cape Commission, to which it should be added that there are about 50 in Natal, and others belonging to the British Association and other bodies, further to the N. and W.; so that we think that the entire number of rain records kept in Africa, S. of the Equator, must be nearly, if not quite, 500.

As regards the intensity of the excess in January, 1898, the following table seems to show that our previous note indicated accurately the locality most affected—*viz.*, the upper portion of the watershed of the Orange River between Bloemfontein and Aliwal North.

Div.	Station.	Lat. S.	Lon. E.	Altitude.	Rainfall in January.		Per cent. of Mean.	Excess in 1898.
					Mean, 1885-94.	1898.		
		° ′	° ′	feet.	in.	in.		
XVIII.	Hope Fountain..	20 20	28 30	4700	10·73	7·75	72	—2·98
IX.	Groot Boetsaap..	28 0	24 25	—	3·82	13·77	361	9·95
XIII.	Mafeting	29 54	27 7	—	5·79	21·78	376	15·99
XIV.	Philipolis	30 13	25 18	4700	3·74	9·16	245	5·42
XI.	Herschel	30 36	27 7	5110	4·24	16·41	387	12·17
,,	Aliwal N.	30 41	26 40	4330	3·30	12·17	369	8·87
VIII.	Colesberg	30 43	25 5	4400	2·30	10·05	437	7·75
XI.	Lady Grey	30 43	27 12	—	5·64	15·92	282	10·28
,,	Barkly E., Avoca	30 44	27 30	—	6·69	18·09	271	11·40
,,	Gateshead	30 58	28 0	—	7·22	14·45	200	7·23
,,	Barkly E.	31 2	27 35	5831	4·22	12·95	307	8·73
XII.	Maclear	31 4	28 21	4300	7·23	14·82	205	7·59
VI.	Camfer's Kraal..	32 17	23 3	3000	1·39	4·74	341	3·35
VII.	Somerset East...	32 44	25 35	2400	3·34	9·65	289	6·31
X.	Thaba N'doda...	32 50	27 1	—	3·98	12·88	324	8·90
III.	Piquetberg	32 53	18 45	700	·15	·85	566	·70
II.	Houw Hoek	34 12	19 10	960	·51	3·80	745	3·29

* We believe that both the Orange Free State and Natal have separate organizations; Mr. Stewart has quoted only one station for each, but as regards Natal, we have taken the full details from the *Natal Farmers' Magazine*, which some unknown Sheffield correspondent is so kind as to send us.

REVIEWS.

Science Progress. New series. Vol. II., No. 8. July, 1898, large 8vo. Scientific Press, London, 1898.

WE take the earliest opportunity of telling those of our readers who are interested in the History of Meteorites, or as the author entitles his article, "*The Fall of Meteorites in Ancient and Modern Times*," where to find a treat. It is a lecture given by Prof. H. A. Miers, F.R.S., Waynflete Professor of Mineralogy in the University of Oxford, printed in the above number of *Science Progress*. Of course, in one lecture it is impossible to deal with a literature which we suppose would, in the aggregate, take at least 30 ft. of shelving, and Prof. Miers did not attempt the impossible; but he has wisely taken only one aspect of the subject, and has concentrated in 22 pages information which few writers could have given, and which still fewer would have been willing to compress into a single lecture.

Wragge's Australasian Weather Guide and Almanac for 1898. 8vo. Sapsford & Co., Brisbane, 1898.

IT is rather more than ten years since Mr. Wragge was appointed Government Meteorologist for Queensland, and during the whole period we have not received a single annual or other summary of the observations made in that colony. We are aware that Mr. Wragge has been very busy establishing stations, and it is of course quite possible that the regular publications which used to be issued in Queensland, as well as in the other Colonies, have been continued; all that we know is that nothing, except some large scale maps, has come under our notice.

Now, however, Mr. Wragge appears as the patron of an Almanac, which the publishers hope to make an Australian "Whitaker," and although we do not know what rivals may already exist, we do not see any reason why we should not wish that their hope may be fulfilled.

The present volume is excellently printed, on very good paper, and amply illustrated,—the tree or trees in the view of the Brisbane Observatory improve its appearance, but suggest anxieties respecting their influence upon the records. Mr. Wragge is too experienced to approve of trees near his instruments, how then do they get into the photograph whence the block was prepared?

Much of the mass of information given is very good; but on the whole we are inclined to regard as the best, the article on Artesian Water Supply, by Mr. W. Gibbons Cox, C.E., in which we have noticed only one mistake—(on p. 251) there are no "waterworks at Kentish Town," and the old chalk supply pumped there, was spoiled and abandoned nearly 50 years ago.*

**Met. Mag.*, Vol III., (1868) p. 176.

While no one can feel otherwise than grateful to Mr. Wragge for his enthusiastic devotion to obtaining meteorological records from Ben Nevis, and while we have no doubt that that enthusiasm alone made possible the establishment of the permanent observatory there, we are still waiting for evidence of the utility *for forecasting purposes* of the records from it, or any other lofty station. Though there may be excitement and fun in starting stations on Mount Kosciusko, or Mount Wellington, we should have waited until the London Meteorological Council had announced that Ben Nevis records were useful for forecasting purposes. Have not the United States authorities given up Pike's Peak and Mount Washington? Does M. Fron rely upon the records from the Pic du Midi or the Puy de Dôme?

Earthquakes and other Earth Movements, by J. MILNE, F.R.S., G.F.S., late Prof. of Mining and Geology, Tokio, Japan. Fourth ed. Inter. Scientific Series, Kegan Paul & Co., London, 1898. 8vo, xvi.—376 pp., map and engravings.

PERHAPS there is no stronger evidence of the widespread interest now taken in what in old times were all considered together as "Earthquakes and Volcanoes," than the fact that the International Scientific Series has, or will shortly have, three separate volumes devoted to them,—Prof. Judd's *Volcanoes*, which has reached its fifth edition, Prof. Milne's *Earthquakes*, of which we now welcome the fourth edition, and *Seismology*, by Prof. Milne, which is announced in the work before us.

The volume is crammed with facts, and with sound conclusions based upon them, and we have not noticed the omission of any aspect of the subject. We are, however, rather at a loss to know why there is not a single reference to all the labour spent upon the Krakatoa eruption. If the answer be that it belongs to the sister volume on *Volcanoes*, we should certainly reply by enquiring whether Admiral Sir William Wharton's work upon the transmission of the sea waves from Krakatoa to the English Channel is not at least equal to any of those quoted between pp. 179 and 186. Perhaps the *Report on the Eruption of Krakatoa* may have the honour of insertion in the appendix to the 5th edition, and might even be accompanied by the *Report on the East Anglian Earthquake of April 22nd*, 1884, by Prof. R. Meldola, F.R.S., and William White, and by the late W. Roper's "*A list of the more remarkable earthquakes in Great Britain and Ireland during the Christian era.*"

However, these are small matters, and the volume is already so crammed with information, that probably the only thing to be done is to jettison some of the cargo—but it would not be easy to select what should go overboard first.

PUBLICATIONS OF THE ROYAL ALFRED OBSERVATORY, MAURITUS.

It is a matter of general knowledge that the publications of this establishment have been distributed somewhat irregularly, and that most European Meteorological Libraries have only incomplete sets.

We have been in communication with the new Director, Mr. T. F. Claxton, F.R.A.S., upon the subject, and thanks to his hearty co-operation we are now able to announce that, for convenience of distribution, all surplus copies have been shipped to us.

Any society, establishment, or person wishing for any of the under-noted publications must send a clearly written list of what is desired; to reach Mr. G. J. Symons, 62, Camden Square, N.W., by October 15th, 1898, after which date he will proceed to allot the entire remaining copies of the said publications.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

Royal Alfred Observatory, Mauritius.

REPORTS.

1876, 1878, 1879, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1894.

RESULTS.

1862, 1866, 1867, 1872, 1873, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895.

Years not mentioned above cannot be supplied, and of some of those quoted there are very few copies.

No charge will be made, but where large numbers are required, applicants will be left to pay carriage.

The Royal Alfred Observatory itself has no copy of the Results for 1886 or 1887; we have had the pleasure of sending a copy for 1886; we hope that every librarian will search for a duplicate of 1887.

We desire to point out that it will be for the general benefit if all who have duplicates of any of the publications of the observatory will send them here, because what is useless to them, may be very useful to some one else.

There is similar incompleteness in the sets of the publications of the Meteorological Society of the Mauritius. We do not know of a single perfect set in Europe—and we hope that eventually we may be enabled to make a similar announcement with respect to its publications.

THE FIFTH INTERNATIONAL CONGRESS ON HYDROLOGY, CLIMATOLOGY AND GEOLOGY.

We have been requested to announce that the above Congress will meet at Liége, in Eastern Belgium, under the patronage of H.R.H.

Prince Albert of Belgium, from September 25th to October 3rd, of the present year.

Those who had the privilege of joining the first of these Congresses (Biarritz and the Pyrenees) in 1886, will not soon, if ever, forget the boundless hospitality and kindness with which they were received. Those who have attended subsequent ones in Italy and in France, know that the example set at the outset has been followed, though not surpassed,—it would be hard, if not impossible, to beat the quaint festivities of Amélie les Bains, or the fairy-like beauty of Luchon. But now the Congress goes to a new country, Belgium, and we know that the Belgians intend to make it a red letter week for all who will go.

We cannot spare space to set out the programme, either of work or of play, but we must give the titles of some of the meteorological papers:—

1.—On the utilization of hygrometric records in relation to medical climatology and hygiene.
2.—On the hygienic importance of records of sunshine.
3.—The advantage of sanitary stations on plateaux in districts without mountains.
4.—Determination of daily mean temperature.
5.—On the importance of researches on the amount of ozone.
6.—On the mean temperature of the air, and of a spring at Spa.

There are, we see in the Geological section, several papers of interest to hydraulic engineers.

We wonder when Bath, Buxton, or Harrogate, or the three combined, will muster up courage enough to invite the Congress to England? Perhaps it is hopeless to think of it. English railway managers would be shocked at what the Continental managers do to facilitate the gathering of scientific men. So we had better not ask our foreign friends to see how much *worse* we do these things in England.

For full details respecting the Congress, railway facilities, excursions, &c., application should be made, in any language, distinctly written, to M. le Dr. G. Jorissenne,

Sécrétaire Général,
Boulevard de la Sauvinière 130,
à Liége.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

JUNE.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 A.M. and 9 P.M.		Highest Month.		Lowest Month.		Extremes at 9 A.M. and 9 P.M.				Mean of all Highest	Mean of all Lowest.
					Mean.					Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·995	30·216 1865	29·782 1860	9 a.m. 9 p.m.	29·995 29·994	30·221 30·211	1865 1865	29·773 29·792	1860 1860	30·600 30·590	27th, 1867 27th, 1867	29·312 29·173	30th, 1865 2nd, 1860	30·323 30·319	29·563 29·563
Shade Temp. Dry Bulb	59·8	65·8 1858	55·4 1871	9 a.m. 9 p.m.	61·5 58·1	68·1 63·5	1858 1858	57·1 53·2	1860 1871	80·8 76·1	16th, 1858 22nd, 1870	48·4 44·3	3rd, 1871 3rd, 1871	72·0 67·9	52·3 49·5
Shade Temp. Max.	71·3	..	...	...	...	79·1	1858	64·7	1860	92·6	16th, 1858	53·5	10th, 1889	83·1	59·1
Shade Temp. Min.	50·9	...	...	...	...	55·1	1858	46·9	1869	63·8	25th, 1878	35·6	1st, 1869	59·4	41·8
Shade Temp. Wet Bulb	55·2	61·0 1858	52·2 1869	9 a.m. 9 p.m.	56·1 54·4	62·6 59·5	1858 1858	53·3 50·9	1886 1869	70·3 69·2	16th, 1858 16th, 1858	44·4 41·8	8th, 1890 8th, 1881	64·5 62·8	48·6 46·5
Solar Rad., black	113·2	...	...	...	...	120·4	1870	106·9	1888	136·8	20th, 1870	64·7	4th, 1890	129·5	76·5
Solar Rad., bright	82·2	...	...	...	...	87·8	1896	76·9	1879	104·3	19th, 1893	57·9	8th, 1897	95·1	63·6
Grass Minimum	47·0	...	...	...	...	49·9	1889	43·4	1869	60·7	25th, 1878	31·0	1st, 1884	56·5	36·8
Soil, 1 foot	58·7	...	...	...	...	62·6	1896	55·3	1879	67·0	20th, 1893	51·2	1st, 1894	63·3	54·3
Cloud	5·6	7·6 1860	3·5 1868	9 a.m. 9 p.m.	6·0 5·2	8·0 7·3	'79, '82 1860	3·5 3·1	1868 1858	10 10	Every year Every yr. but '58	0 0	Various Various	10·0 10·0	0·4 0·1
Rainfall	2·23	6·71 1878	·30 1895	9 a.m. 9 p.m.	·95 1·28	3·09 5·73	1863 1878	·11 ·04	1886 1895	1·55 3·28	19th, 1863 23rd, 1878	·00 ·00	Every year Every year	·41 ·50	·00 ·00

Max. Rainfall in 24 hours, 3·28 in., 23rd, 1878. Mean max. daily fall, ·70 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity. 0-100	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°		°	°	inches		
England, London	55·0	30	29·2	11	47·5	39·8	40·3	86	77·8	26·9	·73	9	8·3
Malta	64·0	10	42·2	29	60·8	51·5	48·1	80	126·5	35·2	2·88	7	6·0
Cape of Good Hope	92·0	16	48·1	28	77·9	60·3	56·3	67	...	...	1·34	5	3·3
Mauritius	86·3	19	71·1	18	84·2	74·2	71·5	80	136·5	65·8	6·48	25	6·4
Calcutta	83·9	26	48·4	8,9	76·5	53·5	51·1	63	140·0	39·0	·36	1	4·9
Bombay	90·8	16	63·3	5	85·1	67·7	63·1	65	137·5	52·5	·00	0	0·0
Ceylon, Colombo	92·7	11	66·8	28	88·2	71·8	70·8	81	150·0	58·0	2·32	8	3·4
Melbourne	109·2	11	48·1	23	82·3	58·3	52·0	54	157·1	38·1	·30	2	3·9
Adelaide	113·3	11	53·2	22	90·1	62·0	50·4	41	173·7	43·0	·09	1	1·7
Sydney	98·1	19	58·3	22	79·5	66·2	69·0	71	148·7	54·0	5·40	14	6·1
Wellington	76·0	6	49·0	19	69·5	55·9	52·0	69	135·0	35·0	·95	5	3·8
Auckland	90·0	4	49·0	19	74·0	58·0	54·0	65	138·0	46·0	3·14	10	5·4
Jamaica, Kingston	93·5	13	63·4	4	86·8	68·1	64·7	69	...	...	·03	1	...
Trinidad	89·0	3,7	64·0	20	85·6	67·4	70·1	82	163·0	61·0	3·05	15	...
Grenada	86·2	3	70·0	20	82·1	72·4	68·8	69	152·2	...	2·65	21	1·1
Toronto	44·9	12	—15·0	30	31·6	17·7	23·2	83	56·2	—17·5	3·65	18	8·1
New Brunswick, Fredericton	37·9	7	—31·5	31	21·2	—3·3	2·0	77	...	...	6·36	13	5·3
Manitoba, Winnipeg	31·4	5	—30·3	10	15·4	—7·9	...	...	...	...	·89	12	4·4
British Columbia, Esquimalt	48·0	14	27·5	23	42·7	34·6	36·0	92	...	...	2·40	18	8·3

REMARKS.

MALTA.—Adopted mean temp. 55°·5, or 2°·6 above average. Mean hourly velocity of wind 11·3 miles, or 0·1 below average. Mean temp. of sea 60°·3. TS8 on 21st and 22nd; H on 21st and 22nd. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·2 above, of dew point 1°·6 above, and rainfall ·77 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles, or 1·4 below average; extremes, 24·8 on 24th and 0·0 on 16th. Prevailing direction E.S.E. to E. by N. L, T, or both, on 23 days; being the greatest number during the period 1861–98, the previous greatest number being 14 in 1877 and 1887. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. 77°·9 or 1°·1 below, mean dew point 1°·2 above, and rainfall ·75 in. below, their respective averages. Mean hourly velocity of wind 9·2 miles; prevailing direction N.N.E. T on 3 days. L on 3 days. TS on 25th. H. O. BARNARD.

Adelaide.—Mean temp. 1°·7 above, and rainfall ·76 in. below, their respective averages for 41 years. An extremely hot and dry summer thus far. C. TODD, F.R.S.

Sydney.—Temp. 1°·4 above, humidity 0·3 below, and rainfall 1·71 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—A small rainfall, but strong winds almost throughout the month; prevailing direction N.W. Temp. 0°·1 above, and R 2·95 in. below, their respective averages. R. B. GORE.

Auckland.—An average month. Mean temp. slightly below the average of 31 years. The max. temp. is, however, one of the highest readings in Auckland. Rainfall slightly above the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·11 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·91	XI.	Builth, Abergwesyn Vic.	4·73
II.	Dorking, Abinger Hall .	1·50	,,	Rhayader, Nantgwillt...	4·15
,,	Birchington, Thor	2·35	,,	Lake Vyrnwy	2·97
,,	Hailsham	1·16	,,	Corwen, Rhug	2·28
,,	Ryde, Thornbrough	2·62	,,	Criccieth, Talarvor	2·83
,,	Emsworth, Redlands ...	2·65	,,	I. of Man, Douglas	1·79
,,	Alton, Ashdell	2·06	XII.	Stoneykirk, Ardwell Ho.	2·09
III.	Oxford, Magdalen Col..	1·44	,,	New Galloway, Glenlee	2·86
,,	Banbury, Bloxham	1·30	,,	Moniaive, Maxwelton Ho.	...
,,	Northampton, Sedgebrook	·46	,,	Lilliesleaf, Riddell	1·69
,,	Duddington [Stamford].	·87	XIII.	N. Esk Res. [Penicuick]	2·35
,,	Alconbury	1·28	XIV.	Glasgow, Queen's Park..	1·98
,,	Wisbech, Bank House...	1·82	XV.	Inverary, Newtown	4·37
IV.	Southend	1·20	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	1·81	,,	Islay, Gruinart School ...	1·75
,,	Colchester, Lexden	1·82	XVI.	Dollar.....	3·52
,,	Rendlesham Hall	2·88	,,	Balquhidder, Stronvar...	3·28
,,	Rushall Vicarage	...	,,	Ballinluig	...
,,	Swaffham	2·57	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	·78	XVII.	Keith H.R.S.....	1·50
,,	Bishop's Cannings	1·67	,,	Forres H.R.S.	1·24
,,	Blandford, Whatcombe .	1·19	XVIII.	Fearn, Lower Pitkerrie..	·91
,,	Ashburton, Holne Vic...	3·24	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	3·86	,,	Invergarry.....	2·42
,,	Hartland Abbey	3·21	,,	Aviemore H.R.S.	1·26
,,	Lynton, Glenthorne ...	1·67	,,	Loch Ness, Drumnadrochit	2·10
,,	Probus, Lamellyn	1·93	XIX.	Invershin	2·56
,,	Wellington, The Avenue	1·94	,,	Durness.....	2·83
,,	North Cadbury Rectory	1·81	,,	Watten H.R.S.....	1·98
VI.	Clifton, Pembroke Road	1·37	XX.	Dunmanway, Coolkelure	3·32
,,	Ross, The Graig	·84	,,	Cork, Wellesley Terrace	1·76
,,	Wem, Clive Vicarage ...	1·39	,,	Killarney, Woodlawn ...	2·73
,,	Wolverhampton, Tettenhall	1·96	,,	Caher, Duneske	2·72
,,	Cheadle, The Heath Ho.	2·15	,,	Ballingarry, Hazelfort...	2·92
,,	Coventry, Priory Row ..	·89	,,	Limerick, Kilcornan ...	...
VII.	Grantham, Stainby	1·16	,,	Broadford, Hurdlestown	2·91
,,	Horncastle, Bucknall ...	1·51	,,	Miltown Malbay	3·89
,,	Worksop, Hodsck Priory	1·33	XXI.	Gorey, Courtown House	2·48
VIII.	Neston, Hinderton	2·09	,,	Athlone, Twyford	3·29
,,	Southport, Hesketh Park	1·85	,,	Mullingar, Belvedere ...	3·48
,,	Chatburn, Middlewood.	2·83	,,	Longford, Currygrane...	3·80
IX.	Melmerby, Baldersby ...	1·70	XXII.	Woodlawn	3·04
,,	Scarborough, Observat'y	1·83	,,	Crossmolina, Enniscoe ..	3·48
,,	Middleton, Mickleton ...	2·02	,,	Collooney, Markree Obs.	3·85
X.	Haltwhistle, Unthank...	2·36	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	1·34	XXIII.	Warrenpoint.....	3·59
,,	Duddon Valley, Ulpha School	5·20	,,	Seaforde..	3·21
,,	Keswick, The Bank.....	2·92	,,	Belfast, Springfield	3·53
XI.	Llanfrechfa Grange	1·82	,,	Bushmills, Dundarave..	2·54
,,	Llandovery	3·15	,,	Stewartstown	3·00
,,	Castle Malgwyn	2·21	,,	Killybegs	4·50
,,	Brecknock, The Barracks	2·63	,,	Horn Head	3·06

JUNE, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·11	— ·90	·20	24	15	77·4	18	40·1	1
II.		Tenterden	2·11	+ ·26	·52	9	13	72·0	21	38·0	1
,,		Hartley Wintney	1·52	...	·50	8	13	78·0	29	...	...
III.		Hitchin	...	...	...	...	...	...	...	...	...
,,		Winslow (Addington)	1·88	+ ·02	·66	25	14	77·0	18	39·0	3, 1
IV.		Bury St. Edmunds (Westley)	3·37	+ 1·58	2·13	9	13	71·0	21*a*	39·0	1
,,		Norwich (Brundall)	3·22	...	1·80	9	16	74·4	18	36·8	1
V.		Winterbourne Steepleton ...	1·02	...	·24	5	7	75·0	11	35·0	3
,,		Torquay (Cary Green)	1·39	...	·35	5	10	74·1	11	42·9	15
,,		Polapit Tamar [Launceston]..	2·04	— ·17	·60	12	14	75·7	11	35·9	15
VI.		Stroud (Upfield)	·98	— 1·41	·29	26	12	78·0	20	43·0	2
,,		ChurchStretton(Woolstaston)	1·37	— 1·18	·25	25	12	73·0	10	39·0	1
,,		Worcester (Diglis Lock)	1·34	— 1·09	·40	25	11	...	..	...	...
VII.		Leicester (Rotherby Hall) ...	·91	...	·29	21	14	...	...	...	...
,,		Boston	·99	— ·90	·20	23	13	80·0	8	35·0	1
,,		Hesley Hall [Tickhill].....	·69	— 1·23	·21	21	14	75·0	8	32·0	15
VIII.		Manchester(PlymouthGrove)	3·20	+ ·55	·75	21	15	77·0	11	40·0	14
IX.		Wetherby (Ribston Hall) ..	1·82	— ·07	·32	21	11	...	...	...	...
,,		Skipton (Arncliffe)	4·95	+ 1·59	1·07	26	16	...	...	...	...
,,		Hull (Pearson Park).	1·66	— ·09	·41	21	14	75·0	29	34·0	1
X.		Newcastle (Town Moor)	2·31	+ ·67	·45	1	13	...	...	...	...
,,		Borrowdale (Seathwaite).....	8·40	+ 1·82	3·27	23	18	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·99	— ·44	·31	22	17	...	...	...	...
,,		Haverfordwest	1·95	— ·61	·44	23	14	75·0	11	39·6	15
,,		Aberystwith (Gogerddan) ...	3·34	...	·70	12	15	83·0	11	...	...
,,		Llandudno.....	1·91	+ ·14	·43	24	15	70·0	11*b*	44·0	2
XII.	SCOTLAND.	Cargen [Dumfries]	2·88	+ ·93	·56	23	10	78·6	9	38·0	1
XIII.		Edinburgh (Blacket Place)...	1·39	...	·28	3	12	73·3	17	41·6	1
XIV.		Colmonell	2·99	...	·61	6	13	79·0	10	40·0	1
XV.		Tighnabruaich	4·09	...	·98	23	13	69·0	9*c*	43·0	1
,,		Mull (Quinish).....	3·55	+ ·26	1·05	23	14	...	...	...	...
XVI.		Loch Leven Sluices	2·20	+ ·45	·50	24	9	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·45	— ·05	·40	24	12	77·3	17	39·9	1
XVII.		Braemar	1·27	— ·72	·28	6	12	73·0	28	32·4	28
,,		Aberdeen (Cranford)	1·36	...	·30	6	13	73·0	29*d*	34·0	27
,,		Cawdor (Budgate)	1·84	+ ·44	·56	22	14	...	...	...	...
XVIII		Strathconan [Beauly]	3·31	+ ·82	·72	1	8	...	...	...	...
,,		Glencarron Lodge.....	4·09	..	·80	24	20	66·8	17*e*	39·0	1
XIX.		Dunrobin	1·60	— ·42	·30	4	10	67·0	29	40·8	1, 3
,,		S. Ronaldshay (Roeberry) ...	2·20	+ ·44	·53	6	16	64·0	9, 29	40·0	2
XX.		Darrynane Abbey.....	2·28	...	·42	23	17	...	...	...	...
,,	IRELAND.	Waterford (Brook Lodge) ...	3·04	+ ·97	1·36	5	13	73·0	10*f*	38·0	3
,,		O'Briensbridge (Ross)	3·25	...	·66	23	16	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·89	+ 1·05	·90	5	14	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·55	— ·11	·43	5	14	74·9	17	41·8	2
XXII.		Ballinasloe	2·99	+ ·69	·55	23	17	70·0	10*g*	40·0	2
,,		Clifden (Kylemore)	5·20	...	1·09	5	18	...	...	...	...
XXIII		Waringstown	3·83	+ 1·76	·85	5	14	75·0	10*b*	36·0	27
,,		Londonderry (Creggan Res.).	3·23	+ ·81	·51	24	20	...	...	...	...
,,		Omagh (Edenfel)	3·40	+ ·93	·92	5	17	73·0	10	41·0	6

+ Shows that the fall was above the average ; — that it was below it.

a—and 29. *b*—and 17. *c*—and 10, 11. *d*—and 30. *e*—and 18. *f*—and 16. *g*—and

METEOROLOGICAL NOTES ON JUNE, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Cold and cloudy, with seven days with a max. temp. below 60°, four being from 12th to 15th. Showery from 1st to 9th also in the last week, but a remarkable absence of TSS. Duration of sunshine 176 hours, being the least in 8 years. Heavy showers and H on 26th, 14 in. fell in ten minutes.

HARTLEY WINTNEY.—An unkind month; cold showers for the first 8 days, followed by a fortnight of dull and cloudy weather with keen dry N. wind. The last week was wet. Distant T on 27th and 28th. Ozone on 19 days. Hay crop good. Dog rose in flower on 9th.

ADDINGTON.—A little R during the first week, then very dry from 7th to 22nd, and from 23rd to 26th a copious rainfall, doing an immense amount of good to the root crops. The 12th, 13th and 14th were cold, the max. temp. being respectively 55°, 53° and 55°. TS on 25th and T on 26th.

BURY ST. EDMUNDS, WESTLEY.—Cold to the 18th, and showery from the 23rd to the end. Remarkable for the heavy R of the 9th and 10th, 2·30 in. falling continuously. Unfavourable for hay-making. TS on 25th. Distant T on 2nd, 6th and 26th.

NORWICH, BRUNDALL.—The month was cool and generally unsettled, with some very cold bleak weather from 12th to 17th, the max. temp. being below 60° on 5 days in succession. Torrential R all night on 10th, particularly from 2 to 3 a.m., and again at 6 a.m. with T and distant L, the fall being the greatest recorded in 24 hours since July 13th, 1889. Sharp TS from 3 to 4 p.m. on 2nd, and at 1 p.m. on 25th. Distant TS from 5.30 to 7.30 p.m. on 6th. T and L on 22nd.

WINTERBOURNE STEEPLETON.—The month was dry and cold, the mean temp. being only 54°·9. The deficiency was greater in the max. readings than in the min. Many of the days on which no R was registered were dull and gloomy, but 10 were noted as bright and beautiful. H on 1st. Distant T on 26th. Foggy on 6th and 21st.

TORQUAY, CARY GREEN.—R 1·25 in. below the average of 22 years. Mean temp. 1°·2 below the average. Duration of sunshine 229 hours 45 minutes, being 7 hours 15 minutes below the average. No sunless day.

POLAPIT TAMAR.—The temp. generally was unseasonably low, and the night of 15th was unusually cold, the temp. on grass touching 32°. T and L on 12th. H on 1st and 2nd.

WOOLSTASTON.—A rather cold month. Mean temp. 57°·1. The hay crop was unusually large.

MANCHESTER, PLYMOUTH GROVE.—On the whole the weather was very unsettled and cold for the season, and there was only one week of summer weather from 7th to 12th inclusive. Mean temp. 57°·3. H shower on 1st. Distant T on 6th. T and L on 26th.

WALES.

HAVERFORDWEST.—June commenced cool and cloudy, with some hours of sunshine and little R. Fine and warm weather set in on 7th and continued to 18th, interrupted by a TS on 12th, followed by a week of broken weather. Bright but cool from the 26th to the end. Hay crop above the average. Sharp TS at 7 p.m. on 12th, with several near flashes of L.

GOGERDDAN.—Very heavy T lasting for two hours on 12th, followed by heavy R.

SCOTLAND.

CARGEN [DUMFRIES].—The temp., rainfall, and sunshine during the month were chiefly remarkable for their very close approximation to the average of 39 years. A period of warm dry weather was experienced for 10 days commencing on 7th, when half of the sunshine of the month (232 hours) was registered, and the max. temp. from 9th to 17th averaged 70°·1. The remainder was characterised by unsettled weather, low temp., and cloudy sky. Light S. and E. winds prevailed on 25 days. On 25th a sharp H storm occurred which did considerable damage to foliage, in some instances beating down the young corn. Farm crops hardly ever looked better at this season, and hay promises to be a heavy crop.

EDINBURGH, BLACKET PLACE.—Mean temp. 0°·3 above, and R 34 per cent. below the average. H on 1st. Slight TS on 24th. T on 21st. Fog on 9th and 10th.

COLMONELL.—R ·12 in., and mean temp. 0°·4, above the average of 22 years.

TIGHNABRUAICH.—A good summer month.

ABERDEEN, CRANFORD.—A cold month with little sunshine.

S. RONALDSHAY, ROEBERRY.—A very good month upon the whole. Mean temp. 51°·6 or 0°·4 below the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—Fine and hot from 6th to 21st; the rest of the month cold, and the last part misty and foggy.

O'BRIENSBRIDGE, ROSS.—A bad month for hay-making. T and L on 12th.

DUBLIN, FITZWILLIAM SQUARE.—An average month. Pressure temp. and R all about the normal value. Conducive to health and propitious to vegetation. It was, however, eminently changeable, and the fluctuations of temp. were abrupt and considerable. Mean temp. 58°·0 or 0°·2 above the average. High winds were noted on 8 days, but there were no gales. The temp. reached or exceeded 70° on 4 days. TS on 12th. T on 26th. H on 1st and 22nd.

OMAGH, EDENFEL.—June was a blustering unsettled month, with rainfall above and temp. below the average. On only 3 days did the temp. reach 70°, but on the other hand there were no night frosts. Oats, barley, turnips, and potatoes luxuriant, and the hay crop heavier than for many years.

No. CCCXCI.]
VOL. XXXIII.

[PRICE FOURPENCE.
Or 5s. per annum post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
British Local Meteorological Publications	97
Results of Meteorological Observations at Camden Square during July for 40 years, 1858-97	106
Royal Meteorological Society	107
Climatological Table for the British Empire, February, 1898 ...	108
Supplementary Table of Rainfall, July, 1898	109
Rainfall and Temperature in July, 1898, at 50 Stations	110
Meteorological Notes on July, 1898	111
Errata in "Meteorological Magazine," 1897	112

AUGUST, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCI.] AUGUST, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

BRITISH LOCAL METEOROLOGICAL PUBLICATIONS.

IT is quite impossible for us to review all the pamphlets of this class which we receive—and are glad to receive—because we always check the rainfall values against those supplied to us in MS., and so not infrequently detect mistakes. But, as we have just said, we have neither time nor space to review them regularly year after year, though many of them are interesting as well as useful, and merit a much larger circulation than they obtain.

We intend to give a list of those we have received referring to 1897, arranging them in the sequence of Divisions, Counties, and Stations adopted in *British Rainfall*, but we must in the first place define what we intend to catalogue—viz. books, pamphlets, and broadsheets referring to the weather of 1897 in the British Isles. We do not intend as a rule to include articles, letters or tables in newspapers, even though a few separate copies may be pulled and supplied to the author—if we did this article would itself become almost a volume. Before starting with our county list it may be well to mention some of the *general* publications of the country. By far the oldest are the Quarterly Reports prepared by Mr. Glaisher, F.R.S., for the "Registrar General of Births, Deaths and Marriages of England and Wales," then similar ones for Scotland, and still later we believe (but have not seen) the like for Ireland. There are the *daily*, *weekly*, *monthly* and *yearly* reports of the Meteorological Office; there are the *Quarterly Journal* and *Quarterly Record* of the Royal Meteorological Society, and the *Journal* of the Scottish Meteorological Society. There is also a section on Meteorology, giving remarks and a tabular summary, in the "Natural History Journal," epitomizing the work done at the various schools belonging to the Society of Friends.

MIDDLESEX.

London (*Old Street*).—An abstract is given in the "Report of the M.O.H.* for Hackney."

London (*Roy.Bot.Soc., Regent's Park*).—Daily observations published in the "Quarterly Record of the Roy. Botanic Soc."

* Medical Officer of Health.

London (*Camden Square*).—Daily observations printed weekly in the "Journal of Horticulture."

SURREY.

For part of this county and of Kent, the daily rainfall at about 70 stations is tabulated by Mr. F. C. Bayard, Pres. R.Met.Soc., printed monthly by the Croydon Microscopical and Natural History Club, and reprinted in full in its annual "Report."

Redhill (*Oxford Road*).—Summary with remarks in 12-page 8vo. pamphlet privately printed by the observer, Mr. W. H. Tyndall, F.R.Met.Soc., entitled "Meteorology, Oxford Road, Redhill."

Horsell (*Lindisaye*).—Abstract in "Report of M.O.H., Guildford."

KENT.

Margate (*Apsley House*).—Report by the observer (Mr. Stokes, F.R.Met.Soc.) is printed with the "Report of the M.O.H., Margate."

Greenwich (*Royal Observatory*).—Daily observations published in the "Weekly Return of the Registrar General" and a complete volume a year or two after date.

SUSSEX.

Eastbourne (*Wilmington Square*).—Summaries and remarks by Mr. Sheward, F.R.Met.Soc. (in, we believe, two editions annually, one 16mo. for the pocket, and the other 8vo.) entitled "Annual Report of Meteorological observations."

Crowborough (*The Observatory*).—Summary and table privately printed in foolscap folio by Mr. C. L. Prince, F.R.A.S., F.R.Met.Soc. A very important series going back, at Uckfield, with, we think, few exceptions, for half a century. "The Summary" for 1897 is accompanied by a beautiful process block representing the Seaford hailstones of May 30th.

HAMPSHIRE.

Old Lodge [*Salisbury*].—The observer (Mr. E. Lamb) prints privately a compact broadsheet table of "Climatological Observations," *i.e.* a tabular statement of extremes and means.

HERTFORDSHIRE.

The monthly rainfall at stations in this county and a few outside is collected by Mr. J. Hopkinson, F.L.S., F.R.Met.Soc., and published in the "Transactions of the Hertfordshire Natural History Society," in which publication is also given a summary of Mr. Hopkinson's own observations at *The Grange, St. Albans.*

Great Berkhampstead (*Rose Bank*).—Mr. E. Mawley, Sec. R.Met.Soc., has for many years published a summary of his observations under the title "The Rose Year" in the annual volume "The Rosarian's Year Book."

OXFORD.

Oxford (*Radcliffe Observatory*).—Daily observations are printed *in extenso* in an 8vo volume, part of the "Radcliffe Observations."

NORTHAMPTON.

Here again we have a county organisation, under the personal care of Mr. Christopher Markham, F.S.A., F.R.Met.Soc., who collects the returns and publishes them in the Trans. of the Northamptonshire N.H.Soc.

HUNTINGDON AND CAMBRIDGE.

Many of the rain returns for these counties (and a few just outside them) are collected and edited by Mr. H. G. Fordham, and published monthly in a 4to table.

NORFOLK.

Although published only in a newspaper, we cannot pass without mention the very valuable series of monthly tables of daily rainfall at about 40 stations which for more than a quarter of a century have been compiled by the Rev. Canon Du Port and published in the "Norfolk Chronicle."

Norwich (*Brundall*).—Remarks upon each month and a tabular statement for the year are contributed yearly under the title "Meteorological Notes," by Mr. A. W. Preston, F.R.Met.Soc., and published in the "Trans. of the Norfolk and Norwich Naturalists' Society."

DORSET.

The rainfall of Dorset has been discussed with great care by Mr. H. Storks Eaton, M.A., F.R.Met.Soc., and several valuable reports have been published by him in the "Proceedings of the Dorset Nat. His. and Field Club." We have an impression that monthly tables also are now being prepared under the Club's auspices, and published in the local papers, but we do not receive them.

DEVONSHIRE.

Respecting what is being done in this county, we are not fully aware. In the early years of the Devonshire Association there used to be a Meteorological Committee, which reported to the annual meeting. At that time Mr. Pengelly, F.R.S., of Torquay, was in full activity, and he communicated two or three papers per annum, so that a considerable amount of meteorological publication took place, and there were long rainfall tables published by the "Western Morning News." We have seen none of these for a long time, and therefore do not know whether or not they are being continued.

CANCELLED 2210854

Plymouth (*The Hoe*).—The results for this and other stations established by the Corporation are issued annually (but we have not had 1897) as a pamphlet (8vo, 26 pp.), "Meteorological Report," by Mr. H. Victor Prigg, A.M.I.C.E., Borough Meteorologist.

Rousdon [*Lyme Regis*].—For, and since, 1884 the observations at this station have been published yearly in 4to under the care and at the cost of Mr. Cuthbert E. Peek, M.A., F.R.A.S., F.R.Met.Soc., under the title "Rousdon Observatory, Devon. Meteorological Observations." The observatory is fully equipped, and the results are well worked out, the last received (1896) has a fine general view of the station, but a ground plan, drawn to scale, is much needed; without one it is almost impossible to follow the arguments on pages 19 to 21 of the 1896 volume.

Barnstaple Athenæum.—Mr. Wainwright started the compilation of a monthly table of rainfall for stations in N. Devon; it is, we hope, going on, and being published in the local press, but we have not seen a copy for many months.

CORNWALL.

This county has long been represented in current meteorological publications—the names of Barham, Dymond, Fox, Jordan, Liddell, Moyle, Richards, Squire, Whitley, at once occur to us, but we have to deal with present workers only. Cornwall is (as far as we are aware) alone in having a County Council which takes the slightest notice of its climate. Originated we believe by Mr. Trevail, a fcap. folio monthly summary of statistics of meteorology and diseases has for some years been issued at the cost of the County Council.

Falmouth Observatory.—For twenty years at least the Annual Reports of the "Roy. Cornwall Polytechnic Soc," prepared by Mr. W. L. Fox, F.R.Met.Soc., have contained summaries of the observations at Falmouth, and of these, separate copies are printed for gratuitous distribution. Originally these reports included data for other stations in West Cornwall and Scilly, but since 1892 have dealt with Falmouth alone.

Truro (*Roy. Inst.*)—In bygone years we used to receive copies of the "Reports of the Roy. Inst.", which contained abstracts of the observations made at the Institute; we do not know whether they are continued.

Liskeard (*Dean Terrace*).—For more years than (without a long search) we can tell, but certainly for more than a quarter of a century, an interesting broadsheet has been issued by Mr. S. W. Jenkin, C.E., giving an abstract of his observations for the year, and a comparison with those of previous years. As we see that the values for 1897 are compared with those for the "previous 34 years," it is not improbable that the series extends over that long period.

SOMERSET.

Bath Royal Institute.—In the time of the late Rev. L. Blomfield various abstracts of these observations were published, and they may be continued, but we have nothing later than "The 68th Report of the Bath Roy. Lit. and Sci. Inst. for 1892," 8vo. 1893.

GLOUCESTER.

Cheltenham (*Naunton Park Villas*)—W. Ll. Evans, Esq. } Each of
,, (*Southam Villa*)—R. Tyrer, Esq. } these gentlemen contributes to local newspapers, and Mr. Tyrer collects the rainfall at many stations in the county, and publishes the monthly totals, but as far as we are aware there is no separate publication issued by either.

Tewkesbury (*Beckford*).—Mr. F. Slade, C.E., F.R.Met.Soc., prepares and issues annually a very full tabular summary of his observations, remarks and notes as a large broadsheet.

HEREFORD.

A county rainfall table is prepared by, and published monthly in, the "Hereford Times," but we are not aware of any separate local publication in this county. Mr. Southall, F.R.Met.Soc., occasionally contributes important papers to the "Transactions of the Woolhope Club," but we do not see that publication and therefore cannot state what is being done.

STAFFORD.

Burton (*St. Paul's St.*)—These observations are, we believe, published in the Reports of the Burton Nat. Hist. and Antiq. Soc., but we do not see them, and for 1897 did not receive the returns at all.

WORCESTER.

Kidderminster (*Prospect Hill*).—Abstract tables published annually in the "Report of the M.O.H. and the Chief Sanitary Inspector."

WARWICK.

Rugby School.—An abstract of these observations is published in the yearly "Report of the Rugby School Nat. Hist. Soc."

Coventry (*City Hospital*).—Abstract in the Annual Report of the M.O.H.

Coventry (*Priory Row*).—The daily rainfall and chatty notes on the weather and on phenological phenomena are reported monthly by Alderman Gulson, and printed in the "Coventry Herald."

Birmingham (*Edgbaston*).—Daily observations *in extenso* with diagrams printed in several colours published annually in the "Proc. Birmingham Nat. Hist. and Phil. Soc," also with another excellent diagram in the "Report on the health of the City of Birmingham," by Dr. Alfred Hill, M.O.H.

LINCOLNSHIRE.

As this is the first of the seven counties (Lincoln, Notts., Derby, Chester, Lancashire, Yorkshire and Flint) in which are stations of the Great Central Railway Company, we have to mention here that, from 1855 onwards the Manchester, Sheffield and Lincolnshire Railway Company (now called the Great Central) has maintained, in connection with its canals, a gradually increasing number of rain gauges (now 50), and prints annually the monthly totals, and a comparison of the yearly total with the mean for previous years.

NOTTINGHAM.

Nottingham (*The Castle*).—Under the title "City of Nottingham. The Meteorology of Nottingham," the Corporation issue annually in foolscap folio a summary of The Castle observations, and monthly rainfall at several stations in the Trent valley, illustrated by the best meteorological diagram for the year of which we are aware, it is about $2\frac{1}{2}$ feet square, and gives *daily* values of all the principal meteorological elements, and also statistics as to disease. Nine different colours are employed in this beautiful diagram.

Worksop (*Hodsock Priory*).—A compact table of results (with several 8vo pages of remarks) is privately printed by Mr. H. Mellish, F.R Met.Soc., under the title of "The Weather of 1897 at Hodsock Priory."

DERBYSHIRE.

We do not know of any separate publication for this county, but Mr. Hunter, C.E., F.R.Met.Soc., supplies a monthly and an annual summary to one of the local newspapers.

CHESHIRE.

For certain stations in this county, also in Lancashire, Yorkshire, Cumberland and parts of Scotland, rain returns from various water works (of which Messrs. G. H. Hill and Sons, MM.I.C.E., are consulting engineers) are given in a privately printed 4to pamphlet issued by them.

Birkenhead (*Bidstone Observatory*).—This establishment, under the care of Mr. W. E. Plummer, F.R.A.S., is recovering the position which it held under its original superintendent, and the results are published by the Mersey Harbour Board in an annual 8vo "Report."

LANCASHIRE.

Heaton Moor [*Stockport*].—Dr. Jordan, M.O.H. for Heaton Norris, published in his annual report for 1895 a summary of his observations. He probably does so annually, but that is the only year which we have seen.

St. Anne's-on-Sea.—Dr. Booth, M.O.H. for this health resort, publishes in his annual report a summary of meteorological observa-

tions, but they are hopelessly wrong. To quote one point only, the mean yearly rainfall for the four years 1893–96 is given as 17·82 in. ! an outrageous value for the Lancashire coast, as is shown by Southport 10 miles S. with 29·42 in., and by Blackpool 5 miles N. with 31·39 in. for the same four years. We have not the report for 1897 or would have dealt with it. Either the records should be trustworthy or they should be given up. Dr. Booth is not wholly to blame, for he appealed in March, 1897, for a proper equipment, whether successfully or not we do not know, but we should have left the report without any returns rather than have given bad ones.

Manchester (*Oldham Road*).—The daily observations are published in extenso in the "Weekly Reports" of Dr. Niven, M.O.H., Manchester.

Bolton (*The Park*).—A tabular summary and a few pages of remarks by the observer, Mr. W. W. Midgley, F.R.Met.Soc., are published annually in 8vo by the Bolton Corporation as "Borough of Bolton. Annual report of the Museums and Meteorological Observatory."

Southport (*Hesketh Park*).—This is one of the best of the "Health Resort" stations, but as we have previously* described one of the "Borough of Southport Meteorological Department's Reports," we need say only that Mr. Baxendell, F.R.Met.Soc., is yearly improving them. The Fearnley Trustees are supplying excellent instruments, and we do not think that there will be a fault to find with the equipment when Mr. Baxendell has thrown away his evaporator, which he says is "In a Stevenson screen, painted white, and erected upon the roof of the observatory."

Over Darwen (*Hoddlesden*).—For this and 14 other stations in Lancashire and Yorkshire maintained by the Waterworks Department of the Blackburn Corporation, an annual table is issued by the Engineer, Mr. W. Stubbs, C.E.

Stonyhurst College.—A very interesting little volume of the "Results of Meteorological Observations" has been issued by the Stonyhurst authorities annually from 1860 to 1897†; they have been noticed on three occasions in these pages, and therefore need not be further described.

Skelwith Fold [*Ambleside*].—Mr. S. A. Marshall issues privately a monthly card giving the total fall of rain for the month at his own stations, and at others in the S.W. portion of the Lake district.

---

* *Met. Mag.*, Vol. XXVIII., p. 75.

† We should be very thankful for copies for 1861, 62, 63 and 64 if anyone possesses a spare set.

YORKSHIRE.

In the "Annual Reports" of the M.O.H. for the West Riding there is a general table of rainfall, which as it is derived from *British Rainfall* it need not be described; but there is another table on an earlier page which suggests other publications, and which seems to indicate one or two unknown observers. The various M.O.H.'s in the Riding have, we believe, to forward to Dr. Kaye a copy of their reports, and Dr. Kaye acknowledges receipt of 121 such printed documents, in 15 of which more or less meteorological information was given. This will be looked into.

Halifax (*Albert*).—For this and 9 other stations belonging to the Halifax Corporation Water Works, a small annual table is printed by Mr. J. A. Paskin, C.E.

Bradford (*Brayshaw Res.*)—For this and 36 other stations belonging to the Bradford Corporation Water Works a table is annually printed by Mr. J. Watson, C.E.

Bradford (*The Exchange*).—We believe that abstracts of these observations are sometimes published by the Yorkshire Naturalists' Union, but have not seen them.

York (*Phil. Soc.*)—We do not know what has happened here. For some years Mr. J. E. Clark, B.A., has prepared an interesting report on the meteorology of the district, but he has left York, and we have seen no report for either 1896 or 1897.

Scarborough (*Observatory*).—For 1896 Mr. E. W. Ellerbeck, F.R.A.S., Meteorologist to the Corporation, published an 8vo "Meteorological Report," consisting of four pages, chiefly tables. We presume that there is a similar (or larger) one for 1897, but we have not seen it.

MONMOUTH.

Marshfield (*Llwynarthan*).—Here again we are not sure as to what is being done.—For many years Mr. F. G. Evans, F.R.Met.Soc., compiled very valuable reports on the rainfall of the district, which were published in the "Transactions of the Cardiff Naturalists' Society," but we have not seen a copy for several years.

Chepstow (*Shirenewton Hall*).—Mr. E. J. Lowe, F.R.S., who, thirty or forty years ago, worked very hard at the meteorology of Nottinghamshire, still devotes much time to the subject, and though he does not publish anything separately, compiles an elaborate report on the meteorology and especially on the rainfall of the district around his new residence, and has it inserted in the local newspapers.

GLAMORGAN.

Penarth (*Cwrt-y-Vil*).—This and several other returns from the county are published regularly in the "Western Mail" and also this year (1898) in "The Cambrian Natural Observer."

I. OF MAN.

We are not aware of any special publication on the meteorology of the Island, but Mr. A. W. Moore prepares an annual summary which is published in the local papers.

DUMFRIES.

Dumfries (*Ivy Bank*).—A full report is prepared annually by the Rev. W. Andson and published in the "Report of the Dumfries and Galloway Nat. Hist. and Antiq. Soc."

EDINBURGH.

Edinburgh (*Blacket Place*).—For 1897 (also for 1895, so probably annually) a carefully compiled summary has been prepared by Mr. Mossman, F.R.S.E., F.R.Met.Soc., and published in the "Proceedings of the Roy. Phys. Soc. of Edinburgh."

LANARK AND RENFREW.

Glasgow, as is well known, is partly in both these counties. Glasgow, as is not so well known, has an exceptional number of parks, and Glasgow is unique in the fact that every park has a thermometer stand, thermometers and a rain guage, and the Superintendent, Mr. J. Whitton, publishes the results annually in an 8vo. pamphlet "Meteorological Notes and Remarks upon the Weather during the year ——, with its general effects upon vegetation." Glasgow fetches the bulk of its water from Loch Katrine, but there are altogether 15 rain guages connected with the Water Works, and an abstract of their results is privately printed annually by the engineer, Mr. J. M. Gale, C.E.

RENFREW.

Paisley (*The Coats Obs.*)—Some years since, there used to be useful summaries of these observations in the "Reports of the Coats Observatory," but we have no recent ones.

STIRLING.

Gargunnock.—Col. Stirling, of Gargunnock, prepares annually for some local society, and favours us with a reprint of, a table giving the monthly rainfall at his own and 14 other stations in the county.

DUBLIN.

Dublin (*FitzWilliam Square*).—Dr. J. W. Moore, F.R.Met.Soc., prepares a very full abstract of, and remarks upon, his observations, but we do not know in what periodical they appear.

Balbriggan (*Ardgillan*).—Although Captain Taylor, F.R.Met.Soc., has not carried on his observations for many years, he has made rapid strides in improving his privately printed 4to. pamphlets "Report and Results of Met. Obs. made at Ardgillan" until the last, for 1897, with its excellent view of the instruments in his beautiful garden, is thoroughly well done.

Obviously the above list has many imperfections; we invite everyone to help us to remove them.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

JULY.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 A.M. and 9 P.M.		Highest Month.		Lowest Month.		Extremes at 9 A.M. and 9 P.M.				Mean of all Highest	Mean of all Lowest.
					Mean.					Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·961	30·193 1885	29·767 1861	9 a.m. 9 p.m.	29·963 29·959	30·197 30·189	1885 1885	29·766 29·769	1861 1861	30·469 30·450	27th, 1882 26th, 1882	29·210 29·247	15th, 1877 14th, 1877	30·302 30·283	29·553 29·547
Shade Temp. Dry Bulb	62·5	68·1 1868	58·1 1888	9 a.m. 9 p.m.	64·1 60·9	70·4 67·1	1868 1859	59·2 56·9	'79, '88 1888	80·3 79·7	21st, 1868 15th, 1881	45·4 49·4	11th, 1888 15th, 1883	73·6 69·7	55·8 53·5
Shade Temp. Max.	74·1	..	...	...	...	82·4	1868	67·1	1888	94·6	15th, 1881	55·5	17th, 1892	85·2	63·3
Shade Temp. Min.	54·0	...	...	...	...	58·4	1859	50·2	1863	66·3	26th, 1872	40·3	19th, 1863	61·5	45·4
Shade Temp. Wet Bulb	57·8	62·9 1859	55·3 1892	9 a.m. 9 p.m.	58·5 57·1	63·7 62·1	1859 1859	55·5 54·1	'88, '92 1862	72·6 70·2	23rd, 1873 22nd, 1873	43·5 46·9	11th, 1888 18th, 1863	66·1 64·4	51·6 50·2
Solar Rad., black	116·2	...	...	...	...	123·4	1874	105·9	1888	137·7	19th, 1881	65·1	15th, 1875	130·6	84·5
Solar Rad., bright	84·6	...	...	...	...	91·4	1887	75·6	1879	105·4	15th, 1881	58·4	21st, 1879	96·3	69·1
Grass Minimum	50·4	...	...	...	...	54·6	1872	45·4	1863	63·8	26th, 1872	32·0	4th, 1877	59·2	40·6
Soil, 1 foot	62·1	...	...	...	...	66·5	1876	57·2	1879	70·3	20th, 1881	54·5	13th, 1888	65·6	58·9
Cloud	5·7	7·9 1879	4·0 '87 '97	9 a.m. 9 p.m.	5·9 5·4	8·6 7·6	1879 1888	3·8 2·8	1865 1897	10 10	Every year Every year	0 0	Various Various	10·0 10·0	0·3 0·1
Rainfall	2·39	5·10 1880	·45 1868	9 a.m. 9 p.m.	1·01 1·38	3·03 3·59	1867 1888	·04 ·02	1863 1868	1·82 1·39	26th, 1867 14th, 1883	·00 ·00	Every year Every year	·41 ·49	·00 ·00

Max. Rainfall in 24 hours, 1·82 in., 25th, 1867. Mean max. daily fall, ·71 in.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday afternoon, June the 15th, at the rooms of the Royal Astronomical Society, Burlington House, Mr. F. C. Bayard, LL.M., President, in the chair.

Matthew William Dunscombe and Robert Stokes-Beagley were duly elected Fellows of the Society.

A paper by Mr. R. C. Mossman, F.R.S.E., was read on the "Frequency of the Non-Instrumental Meteorological Phenomena in London with different winds from 1763–1897." In previous papers, the author has discussed the secular and seasonal variation of various phenomena, and he now gives the results of an analysis of the direction of the surface winds observed during the occurrence of snow, hail, gales, thunderstorms, lightning, fog and aurora. Snow is of most frequent occurrence with north and east winds, and least common with S.W. winds. Hail showers occur most often with W., N.W. and N. winds. Gales are most frequent with W. and S. winds. The greatest number of both summer and winter thunderstorms occurs with W. winds, although the values in summer are high with E., S.E. and S. winds. The greatest number of fogs are recorded on calm days, closely followed by days on which the wind blew from the east.

A paper by Mr. A. L. Rotch also was read, on "The Exploration of the free air by means of Kites, at Blue Hill Observatory, Mass., U.S.A." After giving a brief account of the use of kites for scientific purposes from 1749 to the present time, the author described the various forms of kites which have been employed at Blue Hill Observatory, viz., the Eddy, or Malay tailless kite; the Hargrave cellular, or box kite; and and the Lamson aëro-curve kite. The highest flight was on October 15th, 1897, when by means of four kites, having a combined lifting surface of 150 square feet, the meteorograph, at the end of 20,100 feet of wire, was raised vertically 11,080 feet above the hill. About 200 records from kites have been obtained in the free air at heights from 100 to 11,000 feet in all kinds of weather. Mr. Rotch maintains that the kite can be made of the greatest importance for meteorological investigation. At the recent meeting of the International Aëronautical Committee, at Strassburg, it was recommended that all central observatories should employ kites as being of prime importance for the advancement of meteorological knowledge.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	56·2	1	24·3	21	46·9	35·6	36·0	82	92·1	22·6	1·08	15	6·1
Malta	...	...	...	...	...	...	...	...	...	...	...	...	...
Cape of Good Hope	95·7	22	50·6	2	79·4	60·1	57·5	69	...	...	·92	4	1·5
Mauritius	86·8	9	67·4	13	84·5	74·2	70·4	77	142·1	61·1	3·70	17	5·6
Calcutta	89·1	19	50·2	23	81·5	60·3	55·1	59	144·0	39·2	·00	0	2·3
Bombay	88·4	26	63·9	20	82·6	69·6	64·9	69	135·3	52·9	·17	2	0·9
Ceylon, Colombo	91·4	24	67·5	18	89·6	73·1	70·4	75	154·0	64·0	1·98	8	4·0
Melbourne	107·5	4	47·1	18	86·4	61·9	54·7	51	158·5	35·9	1·06	2	4·8
Adelaide	109·6	1	52·4	17	90·9	67·4	52·2	41	163·9	42·2	·55	4	3·0
Sydney	94·8	9	59·8	20	78·6	65·9	62·6	70	162·1	50·9	4·92	8	5·2
Wellington	75·6	1	44·0	2	67·3	52·2	52·8	79	133·0	36·0	1·85	8	4·0
Auckland	78·5	18	47·5	2	71·2	56·1	53·9	71	140·0	44·0	·78	3	4·3
Jamaica, Kingston	87·3	17	63·2	7	84·3	66·4	64·5	74	...	...	2·66	8	3·0
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	86·8	11*a*	69·6	21	82·5	71·2	67·2	71	155·2	...	2·16	13	3·1
Toronto	46·9	11	— 5·6	1	30·9	17·2	23·2	86	63·0	—10·8	3·06	17	7·2
New Brunswick, Fredericton	46·9	25	—20·5	...	31·4	12·1	15·0	75	...	...	3·71	11	6·7
Manitoba, Winnipeg	37·5	12	- 26·6	18	17·4	—7·5	...	...	...	...	1·07	7	4·9
British Columbia, Esquimalt	54·6	27	31·8	19	48·0	38·5	39·3	89	...	...	5·19	19	8·3

a—and 12.

REMARKS.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·3 above, and rainfall 3·14 in. below, their respective averages. Mean hourly velocity of wind 10·2 miles, or 1·2 below the average; extremes, 26·6 on 4th and 1·6 on 20th. Prevailing direction E.S.E. L on 3rd, T on 20th, and L and T on 21st and 22nd. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 80°·8 or 0°·7 above, of dew point 0°·2 above, and rainfall ·07 in. above, their respective averages. T88 on 7 days. L on 3 days. H. O. BARNARD.

Adelaide.—Good rains in the interior and far N. district in the early part of the month, and over the colony generally at the close, breaking up the drought. Mean temp. 5°·4 above the average for 41 years, only two Februarys having had higher temp. C. TODD, F.R.S.

Sydney.—Temp. 1°·4 above, humidity 3·7 below, and rainfall ·43 in. below, their respective averages. A monsoonal rainstorm passed over the colony from 10th to 14th, causing heavy floods on the Hunter and Hawkesbury Rivers.

H. C. RUSSELL, F.R.S.

Wellington.—On 1st a sudden storm from S. caused a severe dust-storm, with rain and hail and the bar. fell to 29·3; rain and hail also on 2nd, then showery to the 7th. The remainder of the month was tolerably fine, but generally strong N.W. winds; fog on 17th and 18th. Slight earthquake before midnight on 13th. Mean temp. 2°·8, and rainfall 1·69 in., below their respective averages. R. B. GORE.

Auckland.—An unusually dry and cool month, the rainfall being little more than one-fifth of the average of 31 years, and the temp. 4° lower than the average.

T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 1·5 miles. Rainfall for the two months of the year one-third over the average. Hailstorm at King's Valley in the lowlands on 24th. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·51	XI.	Builth, Abergwesyn Vic.	1·36
II.	Dorking, Abinger Hall .	·51	,,	Rhayader, Nantgwillt ...	1·04
,,	Birchington, Thor	1·26	,,	Lake Vyrnwy	1·20
,,	Hailsham	·53	,,	Corwen, Rhug	1·65
,,	Ryde, Thornbrough	·27	,,	Criccieth, Talarvor	·73
,,	Emsworth, Redlands ...	·46	,,	I. of Man, Douglas	·28
,,	Alton, Ashdell	·49	XII.	Stoneykirk, Ardwell Ho.	·54
III.	Oxford, Magdalen Col..	·47	,,	New Galloway, Glenlee	·89
,,	Banbury, Bloxham	·85	,,	Moniaive, Maxwelton Ho.	·49
,,	Northampton, Sedgebrook	·80	,,	Lilliesleaf, Riddell	·85
,,	Duddington [Stamford].	·91	XIII.	N. Esk Res. [Penicuick]	1·60
,,	Alconbury	·83	XIV.	Glasgow, Queen's Park..	1·46
,,	Wisbech, Bank House...	1·17	XV.	Inverary, Newtown	2·97
IV.	Southend	·65	,,	Ballachulish, Ardsheal...	3·42
,,	Harlow, Sheering..... ...	1·58	,,	Islay, Gruinart School ...	·96
,,	Colchester, Lexden	·98	XVI.	Dollar.....	2·06
,,	Rendlesham Hall	1·73	,,	Balquhidder, Stronvar...	1·67
,,	Scole Rectory	1·52	,,	Coupar Angus Station...	·63
,,	Swaffham	1·22	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	·44	XVII.	Keith H.R.S.....	2·30
,,	Bishop's Cannings	·53	,,	Forres H.R.S.	1·57
,,	Blandford, Whatcombe .	·42	XVIII.	Fearn, Lower Pitkerrie..	1·51
,,	Ashburton, Holne Vic...	·56	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	·64	,,	Invergarry.....	1·10
,,	Hartland Abbey	·79	,,	Aviemore H.R.S.	1·43
,,	Lynton, Glenthorne ...	·52	,,	Loch Ness, Drumnadrochit	2·22
,,	Probus, Lamellyn	·80	XIX.	Invershin	2·43
,,	Wellington, The Avenue	·25	,,	Durness	3·27
,,	North Cadbury Rectory	·59	,,	Watten H.R.S.....	1·28
VI.	Clifton, Pembroke Road	·66	XX.	Dunmanway, Coolkelure	1·15
,,	Ross, The Graig	·55	,,	Cork, Wellesley Terrace	1·07
,,	Wem, Clive Vicarage ...	·83	,,	Killarney, Woodlawn ..	1·29
,,	Wolverhampton, Tettenhall	...	,,	Caher, Duneske	1·58
,,	Cheadle, The Heath Ho.	1·32	,,	Ballingarry, Hazelfort...	1·55
,,	Coventry, Priory Row ..	1·10	,,	Limerick, Kilcornan ...	1·46
VII.	Grantham, Stainby	1·46	,,	Broadford, Hurdlestown	...
,,	Horncastle, Bucknall ...	·48	,,	Miltown Malbay	1·51
,,	Worksop, Hodsck Priory	1·61	XXI.	Gorey, Courtown House	1·77
VIII.	Neston, Hinderton	·93	,,	Athlone, Twyford	1·29
,,	Southport, Hesketh Park	·35	,,	Mullingar, Belvedere ...	1·85
,,	Chatburn, Middlewood.	·71	,,	Longford, Currygrane...	·80
IX.	Melmerby, Baldersby ...	1·01	XXII.	Woodlawn	1·11
,,	Scarborough, Observat'y	1·19	,,	Crossmolina, Enniscoe ..	1·26
,,	Middleton, Mickleton ...	·83	,,	Collooney, Markree Obs.	1·45
X.	Haltwhistle, Unthank...	1·56	,,	Ballinamore, Lawderdale	2·02
,,	Bamburgh	·82	XXIII.	Warrenpoint.....	·48
,,	Duddon Valley, Ulpha School	2·16	,,	Seaforde.....	·70
,,	Keswick, The Bank.....	1·13	,,	Belfast, Springfield	·74
XI.	Llanfrechfa Grange	·96	,,	Bushmills, Dundarave..	·75
,,	Llandovery	1·10	,,	Stewartstown	·50
,,	Castle Malgwyn	1·43	,,	Killybegs	1·28
,,	Brecknock, The Barracks	·95	,,	Horn Head	1·06

JULY, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	D
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·09	— 1·59	·46	27	7	82·9	15	43·9	
II.		Tenterden	·25	— 2·10	·10	22	5	78·5	16	42·0	
,,		Hartley Wintney	·49	...	·13	1, 22	6	86·0	16	...	
III.		Hitchin	·93	— 1·79	·37	28	7	77·0	16	42·0	
,,		Winslow (Addington)	·95	— 2·34	·44	1	7	81·0	15	40·0	
IV.		Bury St. Edmunds (Westley)	1·72	— ·85	·61	28	8	73·0	16	45·0	
,,		Norwich (Brundall)	2·00	...	1·00	28	8	76·0	18	40·0	
V.		Winterbourne Steepleton ...	·28	...	·11	1	6	80·2	16	39·0	
,,		Torquay (Cary Green)	·24	...	·07	19	6	78·2	16	49·0	
,,		Polapit Tamar [Launceston]..	·38	— 3·03	·09	22	6	75·9	16	37·7	
VI.		Stroud (Upfield)	·77	— 2·80	·37	1	8	82·0	15	45·0	
,,		ChurchStretton(Woolstaston)	·80	— 2·17	·61	1	7	75·5	16	43·0	
,,		Worcester (Diglis Lock)	·74	— 2·13	·40	1	5	...	...	...	
VII.		Leicester (Rotherby Hall) ...	·98	...	·61	1	5	...	...	...	
,,		Boston	·78	— 2·01	·52	1	6	85·0	15	44·0	
,,		Hesley Hall [Tickhill].....	2·45	— ·22	2·15	22	7	79·0	15	41·0	
VIII.		Manchester(PlymouthGrove)	·62	— 3·17	·20	1	9	77·0	10*a*	42·0	
IX.		Wetherby (Ribston Hall) ..	·87	— 2·31	·52	22	6	...	...	...	
,,		Skipton (Arncliffe)	1·83	— 3·81	·77	17	9	...	...	...	
,,		Hull (Pearson Park).	·50	— 2·09	·22	1	8	74·0	21	40·0	
X.		Newcastle (Town Moor)	·67	— 2·85	·28	28	7	...	..	...	
,,		Borrowdale (Seathwaite).....	3·66	— 7·33	1·49	17	13	...	...	...	
XI.	WALES.	Cardiff (Ely).....	·69	— 3·37	·33	22	3	...	...	...	
,,		Haverfordwest	1·06	— 3·15	·42	1	5	75·8	16	40·2	
,,		Aberystwith (Gogerddan) ...	3·78	...	2·15	22	7	77·0	8	...	
,,		Llandudno.....	·83	— 2·17	·35	1	9	71·2	16	48·0	9
XII.	SCOTLAND.	Cargen [Dumfries]	·56	— 3·37	·32	2	3	75·0	11	40·0	
XIII.		Edinburgh (Blacket Place)...	1·28	...	·28	17	10	74·1	21	42·9	
XIV.		Colmonell	1·09	...	·33	17	10	78·0	21	35·0	
XV.		Tighnabruaich	3·13	...	1·19	5	10	69·0	9, 10	43·0	
,,		Mull (Quinish).....	2·91	— 1·14	·72	5	18	...	...	...	
XVI.		Loch Leven Sluices	·90	— 2·72	·20	4, 17	7	...	...	...	
,,		Dundee (Eastern Necropolis)	·85	— 2·61	·25	28	8	78·5	10	44·1	2
XVII.		Braemar	·87	— 2·34	·29	5	12	73·5	11	32·7	
,,		Aberdeen (Cranford)	·78	...	·19	17	16	75·0	6	35·0	
,,		Cawdor (Budgate)	1·90	— 1·40	·42	17	13	...	...	...	
XVIII		Strathconan [Beauly]	2·38	— 1·12	·86	18	8	...	...	...	
,,		Glencarron Lodge.....	5·66	...	1·72	17	19	71·1	9	37·6	
XIX.		Dunrobin	1·07	— 1·78	·47	17	10	73·0	11	41·0	
,,		S. Ronaldshay (Roeberry) ...	2·83	+ ·47	·73	27	17	67·0	22	44·0	
XX.	IRELAND.	Darrynane Abbey.....	1·39	...	·42	27	12	...	...	...	
,,		Waterford (Brook Lodge) ...	1·55	— 1·98	·71	21	8	78·0	11*b*	40·0	
,,		O'Briensbridge (Ross)	1·82	...	·53	22	8	...	...	...	
XXI.		Carlow (Browne's Hill)	1·05	— 2·47	·69	1	5	...	...	...	
,,		Dublin (FitzWilliam Square)	·94	— 1·74	·34	22	8	75·2	11	44·9	
XXII.		Ballinasloe	1·81	— 1·74	·68	22	10	74·0	10*c*	43·0	
,,		Clifden (Kylemore)	2·58	...	1·30	21	11	...	...	...	
XXIII		Waringstown	·60	— 2·92	·44	21	5	80·0	11	39·0	
,,		Londonderry (Creggan Res.).	·70	— 3·42	·16	27	16	...	...	...	
,,		Omagh (Edenfel)	·61	— 3·11	·30	21	7	74·0	9	38·0	

+ Shows that the fall was above the average ; — that it was below it.
a—and 21. *b*—and 16. *c*—and 12. *d*—and 30.

METEOROLOGICAL NOTES ON JULY, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Rainfall even less than in 1896 and 1897; the record showing only two drier Julys, viz. ·21 in. in 1869, and ·19 in. in 1885, and no other instance of three Julys in succession with less than an inch. Mean temp. two or three degrees lower than in the two previous years. Duration of sunshine 217 hours 40 mins. T in distance on 28th. Max. temp. on 10th only 58°·5.

HARTLEY WINTNEY.—The driest July registered in 12 years; the rainfall being 2·50 in. below the average. In the first three weeks N. winds were prevalent. Ozone was recorded on 17 days. TSS on 27th and 28th; L on 26th. Rainfall of the first 7 months of the year 6·16 in. below the average.

ADDINGTON.—A month of fine weather; nearly half of the small rainfall falling on the first day, followed by absolute drought until the 18th. A fine time for securing the hay crop, which was heavy in this part of the country. The last two mornings were very cold for the season. T on 27th and 28th.

BURY ST. EDMUNDS, WESTLEY.—A cold month with little sunshine, the max. temp. being below 62° on 7 days. TS on 28th.

NORWICH, BRUNDALL.—Generally dry and somewhat cool, the mean temp. being about 2° below the average. No days of excessive heat. Great R with T and L in the early morning on 29th.

WINTERBOURNE STEEPLETON.—Remarkably dry with a complete succession of bright and fine days from the 2nd to the 9th inclusive. The max. temp. reached 80° on only one day, and on the 30th and 31st frost on grass was recorded. Mean temp. 59°·3, being exactly the average of 5 years. No TSS. Fog on 1st and 22nd; distant T on 27th.

TORQUAY, CARY GREEN.—R 2·41 in. below the average of 22 years. Mean temp. 62°·2 or 0°·9 above the average. Duration of sunshine 255 hours 45 mins., being 60 hours 25 mins. above the average. No sunless day.

POLAPIT TAMAR.—The driest July for 18 years, with absolute drought from 2nd to 21st inclusive. Thick fog on 16th; T on 22nd.

WOOLSTASTON.—A very dry month; the country much burnt up, but the hay crop excellent and well gathered in. Mean temp. 59°·4.

HESLEY HALL [TICKHILL].—A very severe TS occurred on the night of 22nd.

MANCHESTER, PLYMOUTH GROVE.—The driest July in 31 years excepting the year of drought, 1868, when the rainfall was ·48 in. Mean temp. 61°·5.

ARNCLIFFE VIC.—A very dry month; the third dry July in succession following the very wet July of 1895.

WALES.

HAVERFORDWEST.—One of the finest Julys on record; it commenced with heavy R on the 1st, after which absolute drought prevailed until the 21st when R fell, and also in the forenoon of the 22nd, followed by fine bright weather again, until the 28th when a little R fell, with a strong wind. Fine weather prevailed on the last three days. Low temp. on grass on 30th, 34°·0.

GOGERDDAN.—A very heavy TS occurred on 22nd, with the greatest R in so short a time for more than 20 years.

LLANDUDNO.—A fine month throughout. Duration of sunshine 247 hours.

SCOTLAND.

CARGEN [DUMFRIES].—High pressure, low temp. and light rainfall were the features of the month. The mean temp. 57°·8 has been lower in eight years since 1860, but only in 1878 was a smaller rainfall recorded. Low night temp. was generally prevalent, and the range on several days exceeded 30° being 33°·2 on 15th. More than half the R fell during a TS on 2nd, only ·24 in. falling during the remaining 30 days. W. winds prevailed on 13 days and N. on 14; it is somewhat remarkable that the wind was N.E. on the warmest day of the month. Owing to the dry sunny weather the hay crop was secured in excellent condition, and, owing to the heavy rainfall of the late spring and early summer, it proved of exceptional bulk. Pastures and turnips are suffering severely from the long continued drought.

EDINBURGH, BLACKET PLACE.—A dry month with a good deal of sunshine but no great heat. Mean temp. 0°·2 below the average. R only 38 per cent. of the normal. Mean pressure the highest in July since 1863. TS with heavy R at 2.15 p.m. on 28th.

COLMONELL.—R 2·50 in. and mean temp. 1°·0, below the average of 22 years.

TIGHNABRUAICH.—Everyone satisfied with the weather during the month.

S. RONALDSHAY, ROEBERRY.—Upon the whole a pretty fine month. Mean temp. 53°·2, or 1°·5 below the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—A very dry, fine, hot month. Of the total R, 1·09 in. or nearly four-fifths of the whole, fell on three days.

O'BRIENSBRIDGE, ROSS.—The finest July since 1878, when 1·42 in. of R fell. Frequent T and L on 22nd.

DUBLIN, FITZWILLIAM SQUARE.—Strangely, like July, 1897, this month was very fine and dry with mean temp. 61°·1, or 0·5 above the average. Of the total R more than 60 per cent. fell on 21st and 22nd, the R and number of rainy days being much below the average. High winds occurred on 9 days, reaching the force of a gale on the 18th. The temp. in shade reached or exceeded 70° on 7 days. T on 22nd; solar halo on 20th.

WARINGSTOWN.—A very dry month, but not without precedent in the 36 years recorded, only ·52 in. falling in July, 1863, and ·57 in. in July, 1878.

OMAGH, EDENFEL.—The driest and finest July since the record commenced in 1864, for although there were no very high temperatures (74° being reached only twice), there was warmth enough for the maturing of all crops, which are the finest for years. An abundant hay crop being saved "literally" without a shower.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1897.

REGULAR TABLES.

Waringstown	Mar.	Total rain *should be* 5·35 in., *not* 5·38 in.

SUPPLEMENTARY TABLES.

Stoneykirk, Ardwell House...	Jan.	Total rain *should be* 1·94 in., *not* 1·65 in.
Scarborough, Observatory ...	Mar.	,, ,, ,, ,, 2·69 ,, ,, 2·66 ,,
,, ,, ...	May	,, ,, ,, ,, 1·22 ,, ,, ·88 ,,
Cheadle, The Heath House ...	June	,, ,, ,, ,, 3·18 ,, ,, 3·13 ,,
Bushmills, Dundarave	Oct.	,, ,, ,, ,, 2·34 ,, ,, 2·24 ,,
Lough Swilly, Carrablagh ...	Nov.	,, ,, ,, ,, 2·87 ,, ,, 2·74 ,,

[CCCXCII.]
XXXIII.

[PRICE FOURPENCE.
Or 5s. per annum post-free.

THE NEW YORK PUBLIC LIBRARY

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
British Local Meteorological Publications	113
Absolute Drought in July	116
Evaporation and Temperature	116
Rockall	119
The American Association	120
Thunderstorms of July and August	120
Results of Meteorological Observations at Camden Square during August for 40 years, 1858-97	123
Climatological Table for the British Empire, March, 1898	124
Supplementary Table of Rainfall, August, 1898	125
Rainfall and Temperature in August, 1898, at 50 Stations... ...	126
Meteorological Notes on August, 1898...	127

SEPTEMBER, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

BRITISH RAINFALL.

Subscriptions of £1 and upwards or payments for publications to that amount received to September 13th, 1898 :—

	£	s.	d.
Derby County Asylum	1	1	0
Leicester Corporation	1	1	0
Allison, R. A., Esq., M.P.	1	0	0
Backhouse, T. W., Esq.	5	15	0
Beck, Major W. Alcock	1	1	0
Benyon, J. H., Esq.	1	10	0
Burton, W. C. V., Esq., J.P.	2	0	0
Bute, The Most Hon. the Marquis of	5	5	0
Duckworth, The Rev. W. Arthur	1	0	0
Farrah, John, Esq.	1	1	0
Hervey, M. W., Esq., C.E.	1	11	6
Hill, H. Ashton, Esq., C.E.	1	0	0
Hill, The Rev. Canon	2	0	0
I'Anson, Dr.	1	1	0
Laws, W. G., Esq., C.E.	1	10	0
Lichfield, The Rt. Hnble. the Earl of	1	1	0
Newton, C. E., Esq., C.B.	1	0	0
Oliver, T., Esq.	2	2	0
Pease, Sir J. W., Bt., M.P.	1	1	0
Ramsden, Miss	1	0	0
Rudd, C. D., Esq.	1	1	0
Schuster, The Rev. W. Percy	1	0	0
Scott, Mrs. Septimus	1	1	0
Stirling, Col.	1	0	0
Stocker, The Rev. A. H.	1	1	0
Taylor, W., Esq.	1	1	0
Thompson, Mrs. Heywood	1	0	0
Waterhouse, Edwin, Esq.	1	0	0

THE OBSERVATORY

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.

Contains full Reports of the Meetings of the Royal Astronomical and Meteorological Societies, and of the British Astronomical Association; by various eminent Astronomers, English, American, and Continental. Correspondence on topics of interest connected with the Science; Notes on Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the use and direction of observers.

The Observatory was founded in 1877, and has become an established and very publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCII.] SEPTEMBER, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

THE NEW YOR
PUBLIC LIBRA
ASTOR, LENOX
TILDEN FOUNDA

BRITISH LOCAL METEOROLOGICAL PUBLICATIONS.

(*Continued from p. 105.*)

THANKS to the help of several correspondents, but especially to that of Mr. Baxendell, of Southport, we are able to make important additions to the list given in our last number; but our impression is that unless some hard line of definition be drawn, the list may be extended almost indefinitely—certainly to several hundred publications per annum. Perhaps it would be better to state our reasons for this belief. Although neither the previous M.O.H. to the County Council of the West Riding of Yorkshire (Dr. Whitelegge), nor the present (Dr. Kaye), is a rainfall observer, we have had the pleasure of corresponding with them and receiving copies of their annual reports. In these reports are summaries of those of the Medical Officers of more than one hundred urban and rural sanitary authorities; and we found that several of these local reports contained meteorological data; and Dr. Kaye tells us that for 1897 they are even more numerous. Suppose there are 30. There are also in Yorkshire, the N. and the E. Ridings; if we take them each at one-third of the W. Riding, we have for this one county 50 such reports per annum; and although Yorkshire is the largest and probably most populous of the counties, we must remember that there are 39 others; and if we take each (including Lancashire, Devonshire, &c.) at even one-tenth as many as Yorkshire, we have $39 \times 5 = 195 + 50 = 245$ such reports.

Moreover, in our list we did not quote the report from any lunatic asylum, because we do not now receive any, but we know that meteorological records are kept at many of them, and abstracts used to be given in their reports.

For these reasons we think it probable that if all local publications (irrespective of newspapers) which are issued annually and which contain meteorological data are to be catalogued, the number of entries would reach, or exceed, 200.

However, we give a few more, and we hope that this enquiry will continue (as it has begun) to lead to the discovery of some observers of whom we had not previously heard.

West Sussex.

In his annual report for 1897, Dr. Kelly, M.O.H. for the combined district of West Sussex, gives a few meteorological tables and remarks for Worthing, and monthly sunshine values for Westbourne and for Brighton.

Suffolk.

Lowestoft.—A summary entitled, "Meteorology of Lowestoft in 1896," by Mr. S. H. Miller, F.R.Met.S., F.R.A.S., was printed by the Corporation.

Devonshire.

Torquay.—A full annual report of about 30 pages, by Mr. A. Chandler, F.R.Met.S., Borough Meteorologist, was published in pamphlet form by the Corporation.

The "Fifteenth Report (third series) of the Committee on the Climate of Devon, edited by Alfred Chandler, F.R.Met.S., Honorary Secretary, reprinted from the Transactions of the Devonshire Association for the Advancement of Science, Literature and Art," giving full monthly results for 1896 for 17 stations, also was published separately.

Barnstaple Athenæum.—We have received copy of the tables for several months printed in the "North Devon Herald"; rainfall totals and max. fall at 19 stations, temperature extremes at 7 stations. Monthly rainfall tables are also printed in the "Devon and Exeter Gazette."

Cornwall.

Newquay.—Dr. Hardwick, the local M.O.H., now appends to his annual report a summary of the work of the Urban District Council's Climatological Station.

Gloucester.

Cheltenham.—An "Annual Report upon the Meteorology of Cheltenham," by Mr. Richard Tyrer, B.A., F.R.Met.S., Borough Meteorologist, appeared as an appendix to the annual report for 1897 of Dr. Garrett, M.O.H. for Cheltenham. Mr. Tyrer's report is also published separately as a broadsheet, printed in smaller type than the foregoing. He recently prepared for a local society an interesting paper on the climate of Cheltenham, which has probably by this time been published.

Yorkshire, West Riding.

Bradford (The Exchange).—An elaborate tabular broadsheet is published annually by Messrs. McLandsborough and Johnson.

Reports of M.O.H.—These have already been mentioned, and it does not seem worth while to set out the list *in extenso.*

York (Phil. Soc.)—Mr. J. E. Clark says that he drew up the reports for 1896 and 1897, and the Secretary has promised to send us

copies of the Society's annual reports containing them. Mr. Clark's successor in the meteorological curatorship of the Society is the Rev. — Johnson.

Monmouth and Glamorgan.

Marshfield.—We regret to hear that Dr. Evans has been obliged to discontinue the valuable reports which we mentioned. Our own set is, we regret, very incomplete, but we are glad to hear that there has been no interruption, and that the Society has succeeded in finding another volunteer to carry on Dr. Evans' work.

Carnarvonshire.

At the end of the 1897 report of Dr. Fraser, M.O.H. for the combined sanitary district, appear some monthly climatological results for the year at Carnarvon and Llandudno.

Isle of Man.

A valuable summary of all Manx meteorological observations, read by Mr. A. W. Moore, H.K., before the Manx Antiquarian Society, has been reprinted from the "Manx Sun" of April 30, 1898.

Guernsey.

Two 8vo papers, one upon "The Rainfall of Guernsey for the year 1897" at various stations, and the other upon "The Sunshine of Guernsey for the year 1897," by Mr. A. Collenette, F.C.S., have been reprinted from the "Transactions of the Guernsey Society of Natural Science" and circulated by the author.

Roxburgh.

Hawick (Ladylaw).—A neat sheet of monthly results is published privately annually.

Bute.

Rothesay.—A pamphlet entitled "Abstract of Meteorological Observations made at Barone Cottage, Rothesay, by James Kay," has been issued annually at least as far back as 1889 by the Archæological and Physical Society of Bute.

Argyll (Mainland).

Oban.—Some remarks on the climate, accompanied by a table containing meteorological averages for the 10 years 1887-96, are included in a 48 pp. pamphlet entitled, "Oban: a Health and Holiday Resort," by Dr. Baily, M.O.H.

Dublin.

Dublin (FitzWilliam Square).—Observations published in the "Dublin Journal of Medical Science."

ABSOLUTE DROUGHT IN JULY.

To the Editor of the Meteorological Magazine.

SIR,—An absolute drought has held here for 16 days. The rainfall on the 1st instant was ·21 in., measured at 9 a.m. on the 2nd; since then no rain whatever has fallen till the 18th, ·05 in. fell on that day and ·03 in. on the 19th. Until the present one, there has been no absolute or partial drought since I commenced recording here in October, 1896.

JAMES WATKINS.

13, Park Crescent, Southport, July 20th, 1898.

To the Editor of the Meteorological Magazine.

SIR,—I fancy from what I hear from various correspondents that the drought here must be somewhat in excess of the average. My record for this month is:—

	in.		in.		in.
July 1	·03	July 7	—	July 13	—
,, 2	—	,, 8	—	,, 14	—
,, 3	—	,, 9	—	,, 15	—
,, 4	—	,, 10	—	,, 16	—
,, 5	—	,, 11	—	,, 17	—
,, 6	—	,, 12	—	,, 18	·02

and, in point of fact, the ·02 in. which I record this morning all fell between 7 and 7.15 this day, though, according to our rules, it appears under the 18th.

Faithfully yours,

W. C. PLENDERLEATH.

Mamhead Rectory, Exeter, July 19th, 1898.

EVAPORATION AND TEMPERATURE.

WE have in a previous volume of the *Weather Review* explained how difficult, if not impossible, it must ever be to determine from ordinary observations of the evaporometer the quantity of water added to the atmosphere daily by evaporation from the oceans, lakes and continents. One of the principal elements of uncertainty in determining *a priori* the quantity of evaporation from a given surface of water consists in our uncertainty as to the temperature of the surface water and the velocity of the wind at the surface. If the evaporation observations are made in a shallow tank of quiet water, we have then the still further difficulty of computing what the results would be on the surface of a flowing stream or lake of much greater depth. Professor Carpenter says:—

"It will be noticed that the evaporation from the tanks floating in the various lakes is much greater than that from the corresponding

tank on the grounds of the Agricultural College, which latter tank is of galvanized iron, 3 feet square and 3 feet deep, set in the ground at Fort Collins, so that its rim is flush with the surface of the ground. The elevation is 4,990 feet above the sea level, latitude 40° 34′, longitude 105°. The rain which falls into the tank is allowed for in accordance with the readings of a standard rain gauge near by.

"The excess of evaporation from the tanks floating in the lakes, over that from the tank sunk in the ground is partially, but not entirely, due to temperature. The tanks in the lakes are more freely exposed to the wind than the standard tank, and this would, therefore, make a great difference. The floating tanks are more or less agitated by the waves, and, consequently, the water surface exposed to the air is larger than the cross section of the tank. A film of water is also left on the metal side with every movement of the floating tanks, and this water is apt to be of a higher temperature than the water in the lake or in the tank, and evoporates more rapidly. This influence was noticed by Mr. Trimble, who suggested it as a cause of some of the excess of evaporation observed from the lakes. The effect may be considerable, but how much is uncertain. The wave action differs in the different lakes. As the waves also increase the area of the surface of the lakes, which is exposed to the wind, the resulting measurement in the tank is possibly closer to the loss from the lake than if the tank had been stationary. The effect of increase of surface was an increase of 33 per cent., as deduced from the observations by Aymard in 1849.

"Professor Carpenter gives the following estimate of evaporation from the surface of an open reservoir, at Fort Collins, as based on ten years of observations and corresponding, therefore, to the average cloudiness, windiness, and relative humidity of that location:—

	Evaporation, in inches.
January	1·5
February	2·0
March	3·5
April	5·0
May	6·5
June	8·0
July	9·5
August	8·5
September	6·5
October	4·5
November	2·5
December	1·5
Total	59·5"

Special attention has been given by Professor Carpenter to the temperature of the water in the standard evaporation tank and also in the reservoirs and lakes. As regards the tank, temperatures were observed at 7 a.m. and 7 p.m. as also by self-recording maximum

and minimum thermometers, all near the surface. The mean of the 7 a.m. and 7 p.m. [one hundred and fifth meridian time] is less than the mean of the maximum and minimum by about 3°·5, and the latter is probably much closer to the true average. The difference is attributable to the fact that during the daytime the surface heats rapidly and the lower layers slowly, but during the night-time the whole mass cools more uniformly. On the average of ten years the surface temperature in the tank, namely, the average of the 7 a.m. and the 7 p.m., is as follows :—

April	49°·0
May	58·9
June	67·9
July	72·7
August	70·8
September	63·4
October	51·2
November	41·6

During the other months of the year the tank, of course, is frozen.

The temperature of the free water in Lake Lee, at the surface and at the bottom 6 feet below, as also the temperature of the water in a small tank floating at the surface of Lake Lee, was read every fifteen minutes on August 6th, 1896. Lake Lee is a small reservoir four miles from the college, shallow, exposed to the wind, and full of weeds that greatly hinder the formation of waves. The following is the temperature record :—

Time of Observation.	Clouds, tenths.	Wind.	Temperature of Water.		
			Tank.	Lake.	
				Surface.	Bottom.
9.00 a.m.	.....	.....	71°·0	70°·2	68°·8
9.30 ,,	Few	Lt. S.E.	72·0	70·7	68·0
10.00 ,,	Few	E.	72·0	71·0	68·0
10.30 ,,	1	Lt. S.E.	73·7	72·2	69·0
11.00 ,,	2	Lt. S.E.	74·0	73·0	68·5
11.30 ,,	3	Lt. S.E.	73·2	72·9	68·5
12.00 noon	2	Lt. S.E.	74·2	73·2	69·2
12.30 p.m.	2	Lt. S.E.	74·4	74·0	68·8
1.00 ,,	4	Lt. S.E.	74·0	73·9	68·3
1.30 ,,	7	Brisk N.	73·8	73·8	69·1
2.00 ,,	4	Lt. S.	74·9	74·7	69·8
2.30 ,,	2	W.	75·5	76·0	69·5
3.00 ,,	1	S.E.	76·6	77·2	69·3
3.30 ,,	2	S.E.	76·2	76·0	69·0
4.00 ,,	1	S.E.	76·0	76·0	68·8
4.30 ,,	3	None	76·0	76·2	69·0
5.00 ,,	.....	.....	75·5	76·8	68·6

In reference to this table Professor Carpenter writes to the Editor as follows :—

"At different times we have carried on observations throughout the twenty-four hours on the evaporation tanks, measuring the temperature at the surface, and at one foot below the surface. One of the most marked results was that the average temperature, as determined by observations at twelve hours' interval, was less than the true average by several degrees. The increase in temperature during the day at the surface is quite rapid, and the surface temperature becomes much warmer than the water below the surface. On cooling, however, convective currents form, and the whole mass of water practically cools together.

"I had observations carried on at hourly intervals for several days, at the surface and 1 foot below, which showed this fact clearly. For the last three or four years I determined the average temperature from the maximum and minimum temperatures instead of from the observations at 12-hour intervals, as had been done before."—*Abridged from the Monthly Weather Review, May*, 1898.

ROCKALL.

Mr. Miller Christy, F.L.S., has long been deeply interested in this N.W. outpost of the British Isles; so far away, about 300 miles W. of Scotland, and 260 miles N.W. of Donegal, and so small (only about 80 ft. across) that few persons know it, and no map can show its true size. Most persons regard St. Kilda as practically out of the world, 130 miles W. of Scotland, and severely beaten by Atlantic waves, but St. Kilda is not half way to Rockall; St. Kilda is inhabited, and St. Kilda can be landed upon many days in a year. The August number of *The Scottish Geographical Magazine* gives the best history and account of Rockall that we have ever seen, with two excellent photos, maps, &c.; in fact, Mr. Miller Christy has given a monograph which in every way redounds to his credit, and which we have read through and through with keen enjoyment.

Of course, in these pages we are concerned with it solely as a possible base on which to build a lighthouse and observatory. Mr. Christy quotes upon this subject the high authority of Dr. R. H. Scott, F.R.S. :—

"If a station on Rockall could possibly be established and maintained, its value to weather-telegraphy would be incalculable; but [he adds] there are one or two fearful *ifs* :—

"(1). *If* the place can be built upon;
"(2). *If* the communication by wire can be kept up;
"(3). *If* anyone will live there."

Mr. Christy puts the cost of the cable alone at £35,000 to £40,000, and evidently considers that no building could be erected

on the rock, but we cannot see why the seas should be worse than at Skerryvore; and with a basalt needle about 2000 square feet in area sloping up to 70 ft. above sea level, we should have thought that once get the mortices cut in its upper face, it would be only a question of patience to build another Skerryvore, and at Skerryvore, unless we are mistaken, the builders had to begin almost at sea level, not with a rock from 20 ft. to 70 ft. above it. However, Skerryvore cost £87,000, and therefore with the telegraph cable there would be a capital expenditure of £125,000, which at 6% (to provide for redemption) would require £9000 a year, and there would be probably £3000 more for salaries and expenses, or £12,000 a year. This looks alarming, but we are inclined to agree with Mr. Christy that, "Without doubt, however, the time will come when this difficulty will be successfully overcome."

THE AMERICAN ASSOCIATION.

FROM *Science*, N.Y., of August 19th we see that the following papers are among those to be read at the Boston meeting. We hope that eventually we may be able to give some notice of them :—

Second Report on the Magnetic Survey of Maryland. By Professor L. A. Bauer, Cincinnati, Ohio.

Meteorology from a Mathematical and Physical Point of View. By Professor Cleveland Abbe, Weather Bureau, Washington, D.C.

Lightning Photographed on Moving Plates.

The Structure of Cyclones and Anticyclones.

Temperature and Vapor Gradients in the Atmosphere. By Professor F. H. Bigelow, Washington, D.C.

THUNDERSTORMS OF JULY AND AUGUST.

WE have not space here to treat of this subject fully—in fact, we mention it chiefly in the hope that someone with the necessary time may be induced to volunteer to collect and consider the facts and prepare a paper thereupon. We will gladly lend, or supply, copy of the data in our possession.

The first step will be to collect and reduce to a uniform scale all the records of barometric pressure over the S. of England which can be procured. We have seen several, and their agreements and differences seem equally indicative that careful study will probably be fruitful. As it is the type of the curve on August 18th and the time of the occurrence of certain marked features in it which will be the leading characteristics to be determined, the fact of a curve being a tenth-of-an-inch too high or too low will be of no consequence, and therefore probably nearly every sheet from a recording aneroid for that week would be useful.

We are not here trying to give an account of the storms, but merely arrange in chronological sequence a few notes which appear to us important or suggestive.

JULY 22ND.

On the morning of the 23rd I measured 3·18 in. as the fall of the previous night.—REV. J. C. ROSS, *Wadworth Hall, Doncaster.*

AUGUST 6TH.

Heavy shower early, about 7 a.m.; in 8 minutes 0·27 in. fell. Between 1 and 2 p.m. on the same day we had 0·95 in. in 40 minutes.

MR. J. MATHESON, *Addington, Winslow, Bucks.*

The rainfall of the 6th as measured at 9 a.m. on 7th was—

At West Hill, 8 miles S. of Coventry	1·74 in.
,, Priory Row, Coventry	1·19 ,,
,, The Hospital, ,, ...	1·10 ,,
,, Stoke, 2 miles E. of Coventry	1·61 ,,
,, Coundon, 2½ miles N.W. of Coventry...	1·40 ,,

ALDERMAN GULSON, *Coventry.*

Steady R, with a little T, from about noon till 4 p.m.; total 0·50 in. Heavy R, with wind, 4.30 to 6.50 p.m., yielding 1·09 in.; total for the day 1·60 in.

C. B. MULLINS, Esq., *West Deyne, Uppingham.*

Wing Rectory, Oakham.—R 1·68 in.; little or no T.—REV. H. A. BOYS.

Duddington, Stamford.—R 1·22 in., with a little T.

F. COVENTRY, Esq., *Duddington.*

At 6 a.m. at *Aysgarth, Yorks*, the Ure was in the highest flood for 18 years.—J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

AUGUST 14TH TO 20TH.

This week has been remarkable meteorologically. On Monday, the 15th, from about 9.30 to 10.30 p.m. a heavy thunderstorm occurred, and this left no indication on the barometric curve. On Thursday, the 18th, about 0 hr. 45 min. p.m., a very remarkable black cloud rose on the W. or N.W. horizon, and seemed to fill the landscape with darkness. The effects were very striking; white objects, such as white butterflies and the bellies of the martins and white cows, standing out in startling relief against the black mass. As this rose towards the zenith, a violent wind rose, blowing apparently from every direction, and raising the familiar whirls of dust and leaves. The birds appeared to be greatly alarmed by the condition of things, and flew in troops from bush to bush, as if hoping that each change of position would give them better shelter. At the same time, and as the cloud lifted, there appeared over the horizon a dull red streak of cloud, not so thick as the black cloud, but reminding one of what one has read of sand storms in the East. The cloud passed over without a drop of rain or any lightning. The passage of this storm was marked by a rapid rise and fall in the

barometer. Later in the afternoon—viz., about 4 p.m.—a thunderstorm came on, accompanied by rain, and continued with intermissions late into the evening, accompanied by rapid rises and falls of pressure. About 11 p.m. the wind rose to violence for a short time, accompanied by an almost perpendicular fall in the barometric curve. The comparison of Monday and Thursday in this week seems to afford a striking evidence of the difference between two kinds of storms—those accompanied with disturbances of pressure, and those without such accompaniment.

THE RT. HON. SIR G. FRY, *Failand House, Bristol.*

AUGUST 15TH–16TH.

Wing Rectory, Oakham.—Another great R; 1·80 in. here at 9 a.m. on 16th, and 1·06 in. at *Duddington*; much T and L, but not near.

REV. H. A. BOYS.

AUGUST 18TH.

Violent TS, with almost incessant L in early morning. It began about 1 a.m., and was worst between 2 and 4, with a gale from the S. My old (rather sheltered) gauge gave at 9 a.m. 2·35 in.; the new one gave 2·50 in. The 17th was *very hot.*

R. E. LONGFIELD, Esq., *Longueville, Mallow, co. Cork.*

Heavy TS, with much wind, 7 to 11 p.m.; road about 3 miles S. of *Street, Somersetshire,* much obstructed by fallen trees and branches.

J. EDMUND CLARK, Esq., B.A., B.Sc., *Croydon.*

AUGUST 19TH.

Sharp TS in *Leicester*; the storm began at 6.40 p.m., and in 20 minutes 1·00 in. fell, the total was 1·05 in. in 35 minutes.

E. G. MAWBEY, Esq., M.I.C.E. (Borough Engineer).

AUGUST 21ST.

The sky was clear till afternoon, and the max. temp., 83°·2, occurred about 1 p.m. About 3 p.m. there were signs of an approaching TS, and about 6 p.m. thunder clouds with low rumbling were a few miles to S. or S.E. About sunset another storm was seen approaching from S.E. to S.W., and it was a very fine sight to behold the constant brilliance of the flashes, so constant and continuous that probably for three hours there must have been at least one per second! Apparently most of them moved horizontally, from cloud to cloud. The thunder was loud and continuous, and seemed almost perpetual. The centre passed over a little before 10 p.m., but I think no flash of any consequence was within a mile. It seemed as if there would be no accompanying rain, but for 40 mins., from 9.25 p.m., rain and then hail fell, yielding ·90 in.

H. SOUTHALL, Esq., *The Graig, Ross, Herefordshire.*

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

AUGUST.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.	Means 9 a.m. and 9 p.m.		Highest Month.		Lowest Month.		Extremes at 9 a.m. and 9 p.m.				Mean of all Highest	Mean of all Lowest.
					Mean.					Highest.		Lowest.			
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·946	30·156 1869	29·720 1860	9 a.m.	29·947	30·149	1869	29·716	1860	30·480	14th, 1864	29·149	31st, 1876	30·285	29·506
				9 p.m.	29·945	30·163	1869	29·724	1860	30·488	27th, 1871	29·010	31st, 1864	30·272	29·501
Shade Temp. Dry Bulb	61·3	65·6 1884	57·8 1885	9 a.m.	62·8	67·4	1871	59·4	1860	84·3	18th, 1893	45·2	3rd, 1865	71·6	54·8
				9 p.m.	59·7	64·4	1884	56·1	1885	76·3	11th'84, 17th'93	47·0	2nd, 1867	68·1	52·0
Shade Temp. Max.	72·6	..	...	...	...	77·9	1871	66·6	1860	93·6	18th, 1893	58·5	18'60, 2'67 24'68	84·0	62·7
Shade Temp. Min.	53·4	...	...	...	...	56·4	1893	49·0	1864	67·0	18th, 1858	38·2	27th, 1864	61·1	44·3
Shade Temp. Wet Bulb	57·4	60·0 1871	53·6 1885	9 a.m.	58·1	61·3	1871	54·5	1885	69·5	13th, 1870	45·2	3rd, 1865	65·5	51·0
				9 p.m.	56·6	59·1	'80,'84	52·7	1885	69·8	14th, 1867	45·0	30th, 1869	64·0	49·0
Solar Rad., black	113·6	...	...	...	...	120·2	1873	105·4	1885	134·0	13th, 1870	62·9	12th, 1881	127·9	80·3
Solar Rad., bright	82·8	...	...	...	...	88·8	1893	77·2	1879	104·2	18th, 1893	60·5	17th, 1879	94·8	66·7
Grass Minimum	49·8	...	..	...	...	53·8	1880	44·2	1866	65·0	7th, 1868	31·9	27th, 1864	58·6	39·5
Soil, 1 foot	61·7	...	...	...	...	64·8	1876	58·7	1891	70·3	16th & 18th, '76	56·2	31st, 1890	65·0	58·8
Cloud	5·6	7·4 1860	2·0 1871	9 a.m.	6·0	8·0	1880	2·0	1871	10	Every year	0	Various	10·0	0·3
				9 p.m.	5·2	7·2	1860	2·0	1871	10	Every year	0	Every yr. but '61	10·0	0·0
Rainfall	2·39	6·72 1878	·45 1880	9 a.m.	1·00	2·85	1878	·01	1880	1·10	28th, 1892	·00	Every year	·44	·00
				9 p.m.	1·39	3·87	1878	·10	1871	1·41	17th, 1887	·00	Every year	·48	·00

Max. Rainfall in 24 hours, 1·71 in., 27th, 1892. Mean max. daily fall, ·68 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Maximum. Date.	Minimum. Temp.	Minimum. Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	59·1	18	25·1	13	47·9	33·8	34·8	82	92·1	22·6	1·46	10	6·8
Malta	74·4	26	45·4	3	64·1	51·1	50·3	82	145·4	38·9	1·35	9	4·9
Cape of Good Hope	95·6	12	46·7	8	76·1	57·7	57·3	80	...	...	1·11	4	3·4
Mauritius	84·7	4,12	70·0	2	83·0	74·0	71·5	83	136·3	62·1	6·53	26	7·6
Calcutta	100·1	19	50·2	5	92·9	65·9	56·4	49	155·6	41·7	·00	0	0·8
Bombay	88·9	4	62·3	3	86·5	73·3	68·9	70	137·1	56·3	·00	0	0·6
Ceylon, Colombo	94·5	30	70·0	10	90·2	73·8	72·0	75	155·0	65·0	4·21	6	2·3
Melbourne	96·0	8	41·2	22	75·5	55·5	50·2	59	149·4	35·0	·37	4	3·7
Adelaide	100·4	8	49·6	22	82·9	58·6	49·4	49	160·8	36·8	·06	3	1·6
Sydney	83·8	2	55·6	16	76·3	64·1	60·5	70	146·4	43·1	1·29	14	5·4
Wellington	75·0	8	42·0	31	65·4	51·5	50·6	75	131·0	30·0	2·47	13	4·1
Auckland	73·0	7	47·0	27	69·2	54·9	53·5	74	137·0	43·0	3·02	11	4·4
Jamaica, Kingston	89·6	29	64·0	14*c*	85·7	67·4	64·6	72	...	...	1·31	2	2·2
Trinidad	89·0	2*a*	64·0	7, 22	85·9	69·5	69·0	76	168·0	60·0	2·10	11	...
Grenada	88·2	14*b*	70·0	17*d*	84·3	72·1	66·3	67	154·0	...	1·41	13	2·1
Toronto	61·7	19	9·0	1	44·4	29·0	30·8	77	72·5	6·0	2·40	11	5·7
New Brunswick, Fredericton	52·8	9,13	1·0	4	44·4	20·4	21·8	60	...	...	2·27	11	4·2
Manitoba, Winnipeg	40·2	7	−21·5	22	27·3	4·7	...	...	...	...	2·56	13	6·0
British Columbia, Esquimalt	55·1	1	26·2	26	48·6	34·3	35·8	84	...	...	1·66	17	5·8

a—and 3, 21. *b*—and 28. *c*—and 15. *d*—and 22, 28, 29.

REMARKS.

MALTA.—Mean temp. 56°·4, or 0°·6 above average. Mean hourly velocity of wind 9·3 miles, or 1·7 below average. Mean sea temp. 61°·0. T8S on 6th, 11th and 23rd; L on 13th and 14th; H on 11th. J. F. DOBSON.

Mauritius.—Mean temp. of air equal to, dew point 1°·7 above, and rainfall 1·56 in. below, their respective averages. Mean hourly velocity of wind 9·7 miles or 0·3 below average; extremes, 25·8 on 21st, and 2·1 on 17th; prevailing direction E.S.E. to E. T on 10 days; L on 6 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·2, or 0°·3 above, of dew point 0°·8 below, and rainfall ·73 in. below, their respective averages. Mean hourly velocity of wind 5·8 miles; prevailing direction W. to S.W. T8S on 7 days; L on 7th and 14th. H. O. BARNARD.

Adelaide.—An exceedingly clear, dry month, the mean amount of cloud being 24 per cent. below the average of 30 years. Mean temp. 0°·4 below, and rainfall ·98 in. below, the average. C. TODD, F.R.S.

Sydney.—Temp. 1°·0 above, humidity 5·9 below, and rainfall 4·01 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine; light showers during the middle and end. Prevailing winds from N.W. and S.E., and frequently strong from the former quarter. Some very fine warm weather in the early part. Slight earth-shock on 10th. Temp. 3°·7 below, and rainfall 1·07 in. below, their respective averages. R. B. GORE.

Auckland.—Rainfall about ·75 in. above the average of 31 years. Mean temp. 3° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind in Kingston 1·7 miles. Rainfall for the month about the average, and for the three months a little over the average; the Island rainfall for the same periods being one-third, and two-thirds of the average. Hail at Appleton on the 4th. R. JOHNSTONE.

TRINIDAD.—Rainfall ·23 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·08	XI.	Builth, Abergwesyn Vic.	7·60
II.	Dorking, Abinger Hall .	1·15	,,	Rhayader, Nantgwillt ...	5·07
,,	Birchington, Thor	1·47	,,	Lake Vyrnwy	8·07
,,	Hailsham	1·92	,,	Corwen, Rhug	5·56
,,	Ryde, Thornbrough	1·77	,,	Criccieth, Talarvor	6·02
,,	Emsworth, Redlands ...	1·31	,,	I. of Man, Douglas	6·41
,,	Alton, Ashdell	1·70	XII.	Stoneykirk, Ardwell Ho.	4·50
III.	Oxford, Magdalen Col..	1·61	,,	New Galloway, Glenlee	6·68
,,	Banbury, Bloxham	2·36	,,	Moniaive, Maxwelton Ho.	5·49
,,	Northampton, Sedgebrook	2·39	,,	Lilliesleaf, Riddell	1·89
,,	Duddington [Stamford].	2·97	XIII.	N. Esk Res. [Penicuick]	5·60
,,	Alconbury	2·96	XIV.	Glasgow, Queen's Park..	4·77
,,	Wisbech, Bank House...	2·92	XV.	Inverary, Newtown	6·89
IV.	Southend	·82	,,	Ballachulish, Ardsheal...	8·28
,,	Harlow, Sheering..... ...	1·45	,,	Islay, Gruinart School ...	2·71
,,	Colchester, Lexden	1·11	XVI.	Dollar.....	5·04
,,	Rendlesham Hall	...	,,	Balquhidder, Stronvar...	6·91
,,	Scole Rectory	1·58	,,	Coupar Angus Station...	2·61
,,	Swaffham	2·12	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·35	XVII.	Keith H.R.S.....	3·65
,,	Bishop's Cannings	1·87	,,	Forres H.R.S.	1·82
,,	Blandford, Whatcombe .	1·27	XVIII.	Fearn, Lower Pitkerrie..	2·37
,,	Ashburton, Holne Vic...	3·18	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	4·31	,,	Invergarry.....	2·54
,,	Hartland Abbey	3·87	,,	Aviemore H.R.S.	1·78
,,	Lynton, Glenthorne ...	2·73	,,	Loch Ness, Drumnadrochit	2·45
,,	Probus, Lamellyn	2·82	XIX.	Invershin	3·05
,,	Wellington, The Avenue	3·09	,,	Durness.....	4·53
,,	North Cadbury Rectory	1·58	,,	Watten H.R.S.....	2·45
VI.	Clifton, Pembroke Road	3·46	XX.	Dunmanway, Coolkelure	8·94
,,	Ross, The Graig	2·86	,,	Cork, Wellesley Terrace	4·21
,,	Wem, Clive Vicarage ...	3·91	,,	Killarney, Woodlawn ..	5·23
,,	Wolverhampton, Tettenhall	2·28	,,	Caher, Duneske	6·88
,,	Cheadle, The Heath Ho.	4·36	,,	Ballingarry, Hazelfort...	5·00
,,	Coventry, Priory Row ..	3·88	,,	Limerick, Kilcornan ...	5·41
VII.	Grantham, Stainby	3·30	,,	Broadford, Hurdlestown	6·36
,,	Horncastle, Bucknall ...	2·39	,,	Miltown Malbay	6·28
,,	Worksop, Hodsck Priory	3·29	XXI.	Gorey, Courtown House	4·01
VIII.	Neston, Hinderton	4·10	,,	Athlone, Twyford	5·80
,,	Southport, Hesketh Park	5·14	,,	Mullingar, Belvedere ...	6·05
,,	Chatburn, Middlewood.	6·55	,,	Longford, Currygrane...	4·52
IX.	Melmerby, Baldersby ...	2·64	XXII.	Woodlawn	...
,,	Scarborough, Observat'y	2·85	,,	Crossmolina, Enniscoe ..	4·89
,,	Middleton, Mickleton ...	4·42	,,	Collooney, Markree Obs.	4·15
X.	Haltwhistle, Unthank...	4·45	,,	Ballinamore, Lawderdale	5·41
,,	Bamburgh	1·75	XXIII.	Warrenpoint.....	4·71
,,	Duddon Valley, Ulpha School	12·53	,,	Seaforde.....	4·48
,,	Keswick, The Bank.....	5·88	,,	Belfast, Springfield	...
XI.	Llanfrechfa Grange	3·81	,,	Bushmills, Dundarave..	5·27
,,	Llandovery	6·10	,,	Stewartstown	4·02
,,	Castle Malgwyn	4·16	,,	Killybegs	7·92
,,	Brecknock, The Barracks	3·02	,,	Horn Head	4·24

AUGUST, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. Nights below 32 In shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	1·18	— ·70	·69	7	10	87·9	22	45·9	8	0
II.		Tenterden ...	1·66	— ·20	·98	7	8	85·0	14	46·0	29	0
,,		Hartley Wintney ...	1·07	...	·31	7	12	88·0	15	46·0	28	0
III.		Hitchin ...	1·39	— ·43	·51	15	12	86·0	22	42·0	7	0
,,		Winslow (Addington) ...	2·03	+ ·06	1·14	6	12	85·0	22	43·0	8	0
IV.		Bury St. Edmunds (Westley)	1·80	— ·40	·51	7	14	79·0	14	47·0	7, 8	0
,,		Norwich (Brundall) ...	1·68	...	·47	6	12	86·0	13	44·2	29	0
V.		Winterbourne Steepleton ...	1·35	...	·34	6	14	81·0	15	41·0	9	0
,,		Torquay (Cary Green)	2·10	...	1·00	18	13	78·9	16	48·2	9	0
,,		Polapit Tamar [Launceston]..	3·22	+ ·74	1·43	18	15	78·8	17	40·4	25	0
VI.		Stroud (Upfield) ...	2·97	+ ·88	1·31	6	15	81·0	12*a*	49·0	31	0
,,		ChurchStretton(Woolstaston)	2·88	+ ·12	·52	21	18	77·5	21	46·0	7, 29	0
,,		Worcester (Diglis Lock) ...	2·34	+ ·37	·66	6	17	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·96	...	·99	6	15	83·0	13*b*	41·0	8	0
,,		Boston ...	3·62	+ 1·50	1·67	6	14	86·0	14	42·0	2	0
,,		Hesley Hall [Tickhill]...	3·55	+ 1·39	1·47	3	14	85·0	12	44·0	24	0
VIII.		Manchester(PlymouthGrove)	6·00	+ 2·91	1·04	8	20	83·0	21	44·0	24*f*	0
IX.		Wetherby (Ribston Hall) ...	3·45	+ 1·11	·77	3	14	...	...	...	...	...
,,		Skipton (Arncliffe) ...	8·57	+ 4·24	1·91	5	16	...	...	...	...	...
,,		Hull (Pearson Park).	3·71	+ 1·07	1·10	3	14	81·0	12	44·0	9, 29	0
X.		Newcastle (Town Moor) ...	1·78	— ·93	·33	5	12	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	19·65	+11·20	4·79	26	17	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	3·64	+ ·03	·74	18	15	...	...	...	...	...
,,		Haverfordwest	5·06	+ 1·88	1·10	21	17	77·2	21	45·0	7	0
,,		Aberystwith (Gogerddan) ...	7·40	...	2·20	3	15	82·0	21	...	...	...
,,		Llandudno... ...	4·92	+ 2·56	·83	8	17	79·5	21	46·0	25	0
XII.		Cargen [Dumfries]	6·77	+ 3·78	·96	5	16	79·4	12	40·0	7	0
XIII.		Edinburgh (Blacket Place)...	3·30	...	1·58	30	18	76·9	12	44·0	31	0
XIV.		Colmonell	4·52	...	·68	2	18	80·0	16	36·0	6	0
XV.		Tighnabruaich	6·75	...	1·24	9	18	69·0	22	44·0	8, 30	0
,,		Mull (Quinish)...	6·45	+ 2·30	·86	30	22	...	...	...	...	...
XVI.		Loch Leven Sluices ...	3·70	+ ·76	1·00	30	14	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·30	+ ·73	·75	30	17	76·0	14	43·0	24	0
XVII.		Braemar	3·33	·00	·78	12	21	74·3	12	32·3	25	0
,,		Aberdeen (Cranford)	2·95	...	·63	30	18	75·0	11	39·0	24	0
,,		Cawdor (Budgate) ...	3·11	+ ·86	·86	30	19	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	5·95	+ 2·65	1·45	28	14	...	...	...	...	...
,,		Glencarron Lodge...	9·33	...	2·41	1	23	78·1	22	39·6	9	0
XIX.		Dunrobin ...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	5·17	+ 2·61	1·20	27	20	68·0	13*c*	44·0	30	0
XX.	IRELAND.	Darrynane Abbey...	4·42	...	·89	11	24	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·75	+ 1·33	·89	12	19	73·0	2, 16	44·0	9	0
,,		O'Briensbridge (Ross) ...	6·00	...	·76	18	20	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	5·28	+ 2·31	·77	25	20	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·46	+ ·94	·99	25	18	75·4	5	47·2	9	0
XXII.		Ballinasloe	6·84	+ 3·66	·93	9	22	69·0	17*d*	48·0	31	0
,,		Clifden (Kylemore)	8·67	...	1·95	9	19	...	...	...	...	...
XXIII		Waringstown ...	4·39	+ 1·28	·80	9	19	76·0	16*e*	41·0	31	0
,,		Londonderry (Creggan Res.).	4·23	+ ·11	·69	30	24	...	...	...	...	...
,,		Omagh (Edenfel) ...	5·28	+ 1·79	·90	9	21	72·0	21	41·0	8	0

+ Shows that the fall was above the average ; — that it was below it.

a—and 22. *b*—and 15. *c*—and 14. *d*—and 21, 25. *e*—and 21. *f*—and 28.

METEOROLOGICAL NOTES ON AUGUST, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

CAMDEN SQUARE.—In the 52 weeks ending September 3rd there was no week in which the rainfall reached a total of 1·00 in., while in the preceding year there were 9 weeks with a fall of more than 1·00 in.

TENTERDEN.—A splendid harvest month, but water was again much needed, for although the heavy R of the 7th was of great service, the slight showers of 18th and 27th to 29th were very little good. It was very hot from 11th to 22nd, the temp. on 8 days being over 80° or only 2 days less than in the hot Augusts of 1884 and 1893. Hardly any T. A good deal of wind in the first and last weeks. Duration of sunshine 249 hours. TS on 18th; T on 22nd. The rainfall of the past 16 months is only 27·05 in., or ten inches less than the average.

HARTLEY WINTNEY.—The great drought which had continued through June and July did not terminate in August, this being the driest August since 1886. A great wave of heat prevailed from 12th to 22nd, and rough S.W. winds from 27th to 29th. TSS on 15th and 18th, and L on 21st and 22nd. Ozone registered on 16 days. Great dearth of wild flowers. Rainfall of the first 8 months of the year 6·64 in. below the average.

HITCHIN.—In the 12 months ending August 31st, only 17·27 in. of R fell, against 30 inches in the same months in 1896-7. There has been only one hotter August since the record began in 1849.

ADDINGTON.—A very fine month. A sharp TS with very heavy R occurred on the 6th, and T and L, without R, on the 21st; T on 15th and 16th also. Foggy on 17th. Wasps were very plentiful, and did much injury to fruit.

BURY ST. EDMUNDS, WESTLEY.—The month was cold and wet till the 10th, after that date summer-like and very favourable for the harvest. T on 15th, 19th, 21st and 22nd.

NORWICH, BRUNDALL.—The bulk of the R fell during the week ending 10th. Harvest commenced on 16th, and was favoured with splendid weather, the crops being unusually good. There were great variations of temp.; the max. being above 80° on four days, while 86°·0 on 13th is the highest recorded since 1893. On the 7th the max. did not exceed 58°, but the min. exceeded 60° on 3 nights. Great darkness occurred at 4 p.m. on 6th, with T, L and H: L was seen on 21st, 22nd and 27th, and T heard on 22nd and 23rd. N.W. gale in early morning on 31st.

WINTERBOURNE STEEPLETON.—Another dry month, very similar to August, 1896, when the rainfall was 1·75 in. on 11 days. In June, July and August this year the fall amounted to only 2·65 in., and the shortness of R caused the corn crops to ripen all together. The total R for the first 8 months of the year is 13·61 in., while in 1896 only 12·87 in. fell, but in the September following 8·80 in. fell. The only TS was on the 18th, when vivid L and heavy T occurred, followed by heavy R for a short time between 2 and 3 p.m. L on 21st. Fog at night on 19th and early on 20th.

TORQUAY, CARY GREEN.—Rainfall for August ·68 in. below the average of 22 years, and for the first 8 months of the year 7·25 in. deficient. Mean temp. 63°·6, or 2°·2 above the average. Duration of sunshine 193 hours 35 mins., being 1 hour above the average; no sunless day.

POLAPIT TAMAR.—An average rainfall; a very heavy TS occurring on 18th, with vivid L and heavy showers from 10 a.m. till midnight. T and L on 15th and 21st; distant T on 17th. Thick fog on 1st.

STROUD, UPFIELD.—T and L from 8 p.m. to 11.30 p.m. on 15th; T, L and heavy storm to S. from 8 to 10.30 p.m. on 18th. A small TS about 6 p.m. and a heavy TS to E. at the same time on 21st.

WOOLSTASTON.—The first 9 days were wet and chilly; it then became very

warm and sultry and most favourable for harvest work. Mean temp. 60°·8. A violent storm of T and L occurred from 7 p.m. on 21st to 2.30 a.m. on 22nd; the L was intensely vivid and almost continuous.

MANCHESTER, PLYMOUTH GROVE.—The wettest August for 31 years excepting 1891, when 6·13 in. of R fell. Mean temp. 61°·8.

WALES.

HAVERFORDWEST.—Another wet August, but characterised by bright sunshine and uniform high day and night temp. R fell principally at night or before 11 a.m. and in the two TS8. The TS of 18th commenced between 2 and 3 a.m., with incessant T and L till 6 a.m., but no R. The storm recommenced at 8.30 a.m. and continued till noon, ·50 in. of R falling in 15 mins. from 10.30 a.m. The two following days were fine and sultry. On 21st, at 1 p.m., there were violent gusts of wind, lurid haze, disturbed action of the clouds and sudden darkness; the storm burst at 2 p.m. with heavy R and inky blackness at 3 p.m. At 7.45 a grand storm commenced with a whirlwind, followed by every variety of L, with continuous T. The storm lasted till 10 p.m., but L was visible all night. No storm of similar magnitude has occurred since the great TS of July 19th, 1878. This, as an electrical display, was magnificent and grand but far less destructive, and the absence of H was extraordinary. Crops of every kind are plentiful, and harvest operations were carried on almost without a hitch.

GOGERDDAN.—On the 22nd occurred the most violent TS ever remembered, lasting for 8 hours.

LLANDUDNO.—T and L on 8th, 19th and 21st.

SCOTLAND.

EDINBURGH, BLACKET PLACE.—Temp. 1°·2 above the average; pressure, rainfall, sunshine and humidity normal. TS with heavy R at 7.55 a.m. on 16th; TS with heavy R at 8.30 p.m. on 30th, when 1·42 in. of R fell in 4 hours; H on 28th. Solar halos on 9th and 15th.

COLMONELL.—R ·42 in., and temp. 1°·6, above the average of 22 years. T and L on 27th; T on 22nd.

TIGHNABRUAICH.—Very nearly a repetition of August, 1897, the amount of R being only ·16 in. in excess and the number of rainy days the same. Mean temp. 2°·3 lower than in August, 1897.

S. RONALDSHAY, ROEBERRY.—A very wet month. Mean temp. 55°·1, or 0°·9 above the average of 8 years. A heavy TS occurred on the evening of the 12th.

IRELAND.

DARRYNANE ABBEY.—A rather wet month and the early part very hot. T and L from 8 p.m. on 17th to 4 a.m. on 18th; the longest and one of the heaviest thunderstorms for certainly 30 years. Summer TSS are very rare here.

WATERFORD, BROOK LODGE.—Very broken weather all the month, with heavy TSS on 19th and 21st, and gales from N.N.W. on 23rd and S.W. on 30th.

DUBLIN, FITZWILLIAM SQUARE.—Like August, 1897, this was a changeable, showery and windy, but warm month. Mean temp. 61°·4 or 1°·7 above the average. High winds were noted on 13 days, reaching the force of a gale on four. L on 7th, 15th and 21st; T on 21st. The temp. in shade reached 70° on 9 days. Solar halos were seen on 7th and 9th. The air was foggy on 19th to 21st and 26th.

BALLINASLOE.—L and T on 17th and 21st; L on 16th.

OMAGH, EDENFEL.—August was a much finer and pleasanter month than the record would seem to indicate. The rainfall was considerably above the average, but a large proportion fell at night, and there were many fine bright days with warm air, but without any of the fierce heat of the English stations. The grain harvest was earlier and better than the average, added to a promise of equal abundance in all green crops.

BRITISH RAINFALL.

Subscriptions of £1 and upwards or payments for publications to that amount received to October 12th, 1898 :—

	£	s.	d.
Leeds Corporation	1	16	0
Bazendale, J., Esq.	1	1	0
Bucknall, Percy, Esq.	2	0	0
Fowler, Sir J., Bt.	1	1	0
Logan, Mrs.	1	1	0
Waldegrave, Hon. and Rev. H. N.	1	10	0

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy Meteorological Societies, and of the British Astronomical Association; Artic by various eminent Astronomers, English, American, and Continenta Correspondence on topics of interest connected with the Science; Notices Observatories. Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assista and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observato Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 1

NOTICES.

It is requested that all Books for Review, and Communications the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCIII.] OCTOBER, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

HEAT AND DROUGHT IN SEPTEMBER, 1898.

IN 1895 we had to chronicle a September phenomenally warm and dry, and now—only three years after—we have another September exceptionally dry, and even more remarkable for high temperatures, for referring to the article* above mentioned we find no max. reading in 1895 as high as 90°, while this year we have at least a dozen readings exceeding that point.

RAINFALL.

Dealing first with the drought. Reference to the regular table of rainfall and temperature at 50 stations will at once show that the month was remarkably dry over the whole of England and Wales. We have extracted, to form the following table, all returns in those countries of less than half the average fall. There are 21 stations for which the average is available, and of these, 15 or nearly three-quarters, show a deficiency of more than 50 per cent., and 9 of 75 per cent. The deficiency is most marked in the E. and N.E. of England, where the falls are generally about a quarter-of-an-inch.

Station.	County.	Rainfall in.	Rainy days.	Per cent. of average
Bury St. Edmunds, Westley	*Suffolk*	·20	4	7
Boston.....	*Lincoln*...	·27	3	10
Hull, Pearson Park	*York, E. R.*.....	·26	3	11
Hitchin	*Hertford*	·31	3	12
London, Camden Square.....	*Middlesex*.....	·33	4	13
Manchester, Plymouth Grove	*Lancashire*	·54	8	16
Newcastle, Town Moor	*Northumberland*	·61	5	22
Church Stretton, Woolstaston	*Shropshire*	·60	7	24
Hesley Hall [Tickhill].....	*Nottingham*.....	·51	5	24
Tenterden	*Kent*.....	·77	6	26
Stroud, Upfield	*Gloucester*	·78	6	27
Wetherby, Ribston Hall.....	*York, W. R.* ...	1·13	5	46
Polapit Tamar [Launceston]	*Devon*	1·71	12	46
Haverfordwest	*Pembroke*.....	2·03	9	46
Aberystwith, Gogerddan..	*Cardigan*.....	2·04	7	48

In the next table are given all the absolute and partial droughts which occurred at the 26 English and Welsh stations. Absolute

* See *Met. Mag.*, November, 1895, pp. 150–156.

droughts occurred at nine stations, and partial droughts at 16 stations, but in no case is the duration exceptional, for as is well known, rain fell over the country generally on the 29th, this being the day of max. fall at the majority of stations. We should, perhaps, add, in explanation of the absence of drought of exceptional duration (according to the definitions so long adopted in *British Rainfall*) at a time when it is matter of common knowledge that wells and springs were failing and dry over vast areas of the kingdom, that in the dry districts not only was the rainfall of the years 1895, 1896 and 1897 below the average, but that for more than twelve months past almost every month had a deficient fall, and there was a marked absence of heavy rains.

Droughts in September, 1898.

Absolute Droughts.—Periods of more than 14 consecutive days absolutely without rain.
Partial Droughts.—Periods of more than 28 consecutive days, the aggregate rainfall of which does not exceed 0·01 in. per diem.

Station and County.	Absolute Droughts.			Partial Droughts.			
	Began.	Ended.	Lasted.	Began.	Ended.	Lasted.	Amount
			days.			days.	in.
London, Camden Square, ... *Middlesex.*	None.	...	...	Aug. 16	Sep. 28	44	·35
Tenterden, ... *Kent.*	None.	...	...	Aug. 9	Sep. 17	40	·37
Hartley Wintney, ... *Hampshire.*	Aug. 31	Sep. 16	17	Aug. 16	Sep. 28	44	·34
Hitchin, ... *Hertfordshire.*	Aug. 31	Sep. 17	18	Aug. 16	Sep. 28	44	·25
Winslow, Addington, ... *Buckingham.*	Aug. 31	Sep. 16	17	Aug. 8	Sep. 28	52	·36
Bury St. Edmunds, ... *Suffolk.*	Aug. 30	Sep. 17	19	Aug. 30	Sep. 30	32	·20
Norwich, Brundall, ... *Norfolk.*	None.	...	...	Aug. 11	Sep. 26	47	·46
Torquay, Cary Green, ... *Devonshire.*	Aug. 31	Sep. 16	17	Aug. 19	Sep. 27	40	·40
Stroud, Upfield, ... *Gloucester.*	Aug. 31	Sep. 16	17	Aug. 29	Sep. 28	31	·24
ChurchStretton, Woolstaston *Shropshire.*	None.	...	...	Aug. 31	Sep. 28	29	·28
Worcester, Diglis Lock, ... *Worcester.*	None.	...	...	Aug. 28	Sep. 28	32	·24
Leicester, Rotherby Hall, ... *Leicester.*	Aug. 30	Sep. 17	19	Aug. 28	Sep. 28	32	·22
Boston, ... *Lincolnshire.*	Aug. 30	Sep. 18	20	Aug. 16	Sep. 28	44	·44
Hesley Hall [Tickhill], ... *Nottingham.*	None.	...	...	Aug. 28	Sep. 28	32	·26
Wetherby, Ribston Hall, ... *Yorkshire, W.R.*	None.	...	...	Aug. 30	Sep. 28	30	·23
Hull, Pearson Park, ... *Yorkshire, E.R.*	Sep. 11	Sep. 26	16	Aug. 30	Sep. 30	32	·26

The rain on the 29th was very irregularly distributed, and at several stations reached an exceptional amount, the following being all instances of two inches, or more, yet reported to us.

		in.
Haslemere, Lower Street.....	*Surrey*	2·42
,, Hazelhurst.....	,, ...	2·19
Chiddingfold	,, ...	2·31
Chichester, Chilgrove	*Sussex*	2·09
Midhurst, Borden Wood	,, ...	2·18
Seathwaite	*Cumberland*.....	2·29
Oakley Quarries	*Merioneth*	2·45
Stoneykirk, Ardwell House	*Wigton*.....	2·00

Comparing 1898 with 1895 we find that the former month yielded a larger number of both absolute and partial droughts, but a smaller number of stations with less than half the average fall.

		Absolute Droughts.		Partial Droughts.		Difference from Average.				
	No. of Stations.	No.	Average duration.	No.	Average duration.	No. of Stations.	Below 50 p. c. No.	Below 50 p. c. Average per cent.	Below 25 p. c. No.	Below 25 p. c. Average per cent.
1895	50	4	19 days	2	41 days.	41	30	28	13	17
1898	50	9	18 ,,	16	38 ,,	37	16	25	10	16

For Camden Square we have complete details of the rainfall for 40 years, and at this station, September, 1898, had only ·33 in. of rain on four days, being the smallest September fall in the whole period, and with one exception (1895) the smallest number of rainy days.

TEMPERATURE.

Maximum Temperatures, September 3rd to 9th, and 14th to 17th, 1898.

STATIONS.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	14th.	15th.	16th.	17th.
	°	°	°	°	°	°	°	°	°	°	°
Kensington (Edith Rd.)	82·7	82·7	80·0	81·1	88·2	92·1	85·7	78·5	82·8	85·8	88·6
Regent's Park	82·5	81·5	77·0	78·0	87·0	90·2	85·0	78·0	80·5	82·6	88·0
Camden Square .....*a*	83·7	82·0	78·1	79·1	85·7	90·6	85·9	78·8	80·7	83·6	88·3
,, ,, ...*b*	83·3	82·2	79·1	79·9	86·1	91·2	86·0	79·2	81·1	84·2	89·0
West Norwood.....	82·6	81·5	78·2	78·4	92·1	89·6	87·0	78·4	80·4	81·8	86·9
Brixton	83·0	86·0	80·0	82·0	87·0	91·0	88·0	80·0	81·0	86·0	88·0
Hythe.....	76·5	81·0	85·0	83·5	83·5	88·0	80·0	79·0	76·5	84·5	84·5
Greenwich.....	82·9	82·5	79·0	80·1	84·8	92·1	89·8	80·1	82·0	83·9	89·9
Berkhampstead	81·6	83·1	78·9	80·9	84·5	90·3	82·9	79·3	79·2	83·0	88·2
Addington Manor	80·0	82·0	80·0	81·0	85·0	91·0	81·0	80·0	80·0	83·0	89·0
Oxford (Radcliffe Obsy.)	79·0	83·0	79·0	82·0	85·0	90·0	78·0	75·0	78·0	83·0	86·0
Stamford (Duddington).	75·0	81·0	80·0	81·0	85·0	90·0	78·0	76·0	80·0	83·0	88·0
Cambridge Observatory	79·0	82·0	82·0	83·0	87·0	92·0	84·0	80·0	82·0	86·0	89·0
Norwich (Brundall)	79·0	77·2	67·0	78·0	83·6	87·0	89·0	80·0	77·6	79·0	82·0
Liskeard (Green Bank)..	74·5	78·0	80·0	79·0	75·0	80·0	70·5	69·0	72·0	78·0	62·5
Cheltenham	78·8	80·0	80·0	80·1	81·7	86·0	74·4	75·0	76·8	81·2	83·5
Rotherby Hall	73·0	80·0	81·0	79·0	83·0	89·0	77·0	77·0	78·0	81·0	86·0
Bolton (The Park).....	66·2	76·1	79·9	76·4	78·3	74·2	67·8	69·1	72·9	78·2	78·0
York (Phil. Soc.)	75·0	81·0	80·0	75·0	81·0	81·0	72·0	72·0	72·0	80·0	84·0
Pembroke	62·0	70·0	71·0	64·0	64·0	63·0	63·0	71·0	66·0	69·0	65·0
Llandudno.....	68·0	70·0	81·0	81·0	74·0	68·0	65·0	71·2	73·0	81·0	75·0
Edinburgh.....	67·0	82·0	82·8	80·0	76·2	72·0	63·9	66·3	64·2	78·6	78·5
Nairn	75·0	83·0	83·0	82·0	77·0	68·0	65·0	64·0	64·0	79·0	83·0
Parsonstown	77·0	79·0	78·0	76·0	73·0	66·0	67·0	71·0	70·0	72·0	71·0
Seaforde	73·0	68·0	70·0	71·0	69·0	68·0	65·0	72·0	72·0	70·0	73·0
Jersey...	77·0	80·0	80·0	83·0	79·0	84·0	68·0	68·0	72·0	80·0	79·0
No. of entries of 80° or above	9	19	14	14	17	19	12	5	10	18	18

a Stevenson Screen. *b* Glaisher Screen.

To illustrate the distribution of temp. during the month, we give in the first place a table of shade maxima at 25 stations, from the 3rd to the 9th, and the 14th to the 17th. On all of these days there are numerous entries above 80°, while on the 8th there are no fewer than eleven records of 90° and upwards, while on the 4th, 5th, 6th, 7th, 8th, 16th, and 17th, more than half the stations recorded 80° or upwards. At three stations, Kensington, Brixton, and Addington, the temp. rose to, or above, 80° for seven consecutive days; while there are only four stations in the table, Bolton, Pembroke, Parsonstown, and Seaforde, at which 80° was not reached.

If we take the average of the maxima for these seven days, we find that at 15 out of the 25 stations the average max. was above 80°, while at Brixton it was 85°·3.

Of the stations which give an average above 80°, Duddington, Stamford, is the most northerly, and Cheltenham the most westerly. In other words the area of extreme temperature was the S.E. of England. This is confirmed by the following table of additional max. readings, all believed to be from thermometers in Stevenson screens.

Additional records of Absolute Shade Maximum in September, 1898.

		°	
Addington Hills	*Surrey*	87·5	8th
Wallington	*Surrey*	88·9	8th
Birchington (Thor)	*Kent*	90·0	9th
Slough (Upton)	*Bucks*	91·5	8th
Oxford (Mag. Col. Laboratory)	*Oxford*	88·5	8th
Wisbech (Sutton Bridge)	*Cambridge*	90·5	8th
Marlborough	*Wilts*	85·5	8th
Winterbourne, Steepleton	*Dorset*	81·0	7th
Shaftesbury	*Dorset*	83·8	7th
Ashburton (Druid House)	*Devon*	79·8	8th
Tavistock (Whitchurch)	*Devon*	79·0	8th
Ross (The Graig)	*Hereford*	84·1	8th
Cheadle (The Heath House)	*Stafford*	79·4	7th
Worksop (Hodsock Priory)	*Notts*	85·8	17th
Chester	*Cheshire*	79·9	8th
Blackpool	*Lancashire*	80·4	5th
Driffield (York Road)	*York, E. R.*	84·5	17th
Llanbedr-y-Cennin	*Carnarvon*	81·5	6th
Killarney (Woodlawn)	*Kerry*	80·0	5th

That the intensity of the heat in 1895 was not nearly so great as in 1898 is readily shown by the following summary of the entries in the tables for the two years, which include almost identical stations.

Entries of	80°	85°	90°
1895	74	7	0
1898	155	52	12

It must not be forgotten that in 1898 the hot period occurred at the beginning of the month, while in 1895 it was at the extreme end.

The Camden Square records for the 40 years give as the means for September—

	9 a.m.	9 p.m.	Max.	Min.	Mean of 9 a.m., 9 p.m., M. & m.
	°	°	°	°	°
Mean of 40 years.....	58·1	55·6	67·3	49·7	57·7
1898	60·8	59·7	74·2	51·6	61·6
Excess in 1898	2·7	4·1	6·9	1·9	3·9
1858	61·4	58·7	70·7	53·5	61·1
1865	63·9	59·7	76·4	54·5	63·6
1868	61·9	58·0	71·8	50·0	60·4
1869	60·0	57·4	68·4	51·9	59·4
1875	61·7	58·0	70·8	52·3	60·7
1880	60·3	58·2	69·7	52·8	60·3
1884	60·4	58·8	68·8	52·3	60·1
1886	59·8	56·8	68·7	52·5	59·5
Instances higher than 1898...	4	0	1	7	1

The eight earlier years quoted are the only instances in which the 1898 value for any one of the above columns has been exceeded, and it will be noticed that 1895 does not appear. From it we see, first, that the max. and 9 p.m. temperatures are the most remarkable, and second, that only once has there been a warmer September than that of 1898, namely in 1865. In the 40 Septembers, 1858-97, there were 39 days on which the temp. rose to, or above, 80°; six days on which it rose to 85°, and one on which it rose above 90°, the most notable being—

	Instances of 80° or above.	Instances of 85° or above.	Readings of 85° or above.		Instances of 80° or above.	Instances of 85° or above.	Readings of 85° or above.
1858	2	1	85°·0	1880	3	1	88°·3
1865	10	2	85°·0, 85°·0	1895	4	0	86°·1, 91°·2
1868	5	2	86°·5, 91°·0	1898	8	4	86°·0, 89°·0

From this it will be seen that although the absolute max. in 1898 (91°·2) is unprecedented, and that no other September has had so many days above 85°, yet in 1865 there were two more days above 80°. In 1898 the mean temp. (mean of 9 a.m., 9 p.m., max. and min.) for the seven days 3rd to 9th averaged 69°·6, for the three days 7th to 9th was above 70° and averaged 72°·3, and on the 17th also was above 70°, making a total of 4 days in the month with mean temp. above 70°, while in the whole of the 40 preceding Septembers there were only three days on which the mean temp. reached that value, September 4th, 1880, 73°·0, September 7th, 1868, 71°·7, September 8th, 1865, 70°·7.

OBSERVERS' NOTES.

Kensington, Edith Road, Middlesex.—The highest temperature was 92°·1 on 8th, exceeding by 0°·3 even the max. of August, 1893. The mean temp., 63°·7, is exactly the same as that of September, 1895. Ten days with max. above 80°, and eight nights with min. above 60°. September rainfall ·40 in., and for the nine months of the year 10·00 in.—much the lowest recorded in 15 years.

Haslemere, Hazelhurst, Surrey.—The max. temp. reached 86° on 8th, and 80° or upwards on seven days; the mean max. for the seven consecutive days 3rd to 9th was 81°. There is no previous record of 80° in September. Rain fell on five days; total 2·39 in. Absolute drought prevailed for 18 days, August 31st to September 17th; partial drought for 29 days, with ·19 in. of R, from August 31st to September 28th. On September 29th R began at 6 p.m., and from midnight to 5 a.m. fell in torrents; by 8 a.m. it had nearly ceased, and the total for the 14 hours was 2·17 in.; total for 24 hours, 2·19 in. Even this heavy fall did not penetrate two inches deep through the turf, so dry had it become. The previous heaviest fall in 24 hours is 2·06 in. on September 1st, 1896. Some houses here have been closed in consequence of empty wells and tanks.

Chiddingfold, Surrey.—Records for the past 20 years show no parallel to the present autumnal heat and drought.

1898. Absolute drought for 20 days, August 29th to September 18th, being unprecedented in the second half of the year.

Periods of Great Heat in September.

1898.				1895.			
Sept.	Max.	Min.	Mean.	Sept.	Max.	Min.	Mean.
	°	°	°		°	°	°
3	79	47	63	24	78	48	63
4	80	51	65·5	25	76	53	64·5
5	80	50	65	26	79	51	65
6	81	62	71·5	27	78	50	64
7	84	55	69·5	28	77	49	63
8	82	53	67·5	29	74	49	61·5
9	79	52	65·5	30	73	49	61
Mean	80·7	52·9	66·8	Mean	76·4	49·9	63·1

The only other instance of a max. of 80° in September was in 1880, 80° on 4th. The max. quoted for September, 1895, occurred three weeks later in the year, and are, therefore, not strictly comparable with 1898.

Hitchin, The Firs, Herts.—From 1849 the temp. never reached 90° until the middle of August, 1893, while on the 8th of September, 1898, it rose to 91°·5. Comparing the two hot periods we have—

	°
Average max. for 17 days in August, 1893	77·5
,, ,, ,, September 1898	77·1

I expected to find September, 1898, the hottest we have ever had, but 1895 just beats it.

Mean temp., September,	1895	60°·4
,, ,,	1898	60°·1

This heat was accompanied by a water famine, miles and miles of country being without a drop anywhere, and people coming from all parts to the rivers here. The two driest periods of 12 months recorded in 48 years are—

	Rainfall.
August, 1867, to July, 1868	16·54 inches.
October, 1897, to September, 1898	15·79 ,,

Lowestoft, Belle Vue Park, Suffolk.—In September rain was recorded only on 8th, ·12 in., and 27th, ·04 in., total ·16 in.; being 2·12 in. less than the average for 20 years. In the three months July–September the total fall was only 3·22 in. on 21 days, a deficiency of 4·22 in.

Yarmouth, Market Place, Norfolk.—September, 1898, total rainfall ·20 in. on 5 days, being 2·44 in. less than the average. Previous driest September, 1895, ·57 in.

Total rainfall to September 30th,	1898 ...	13·11 inches.
,, ,, ,,	1893 ...	13·07 ,,

Max. temp., September, 1898, 85° on 9th, the highest since July, 1881. Mean temp. 60°·2. Mean temp., September, 1895, 60°·3.

Garstang, Bruna Hill, Lancashire.—I wrote you at the time *re* the high min. temp. (65°) registered here on the night of the 4th August, 1897. That reading was exceeded so late as September 17th, the min. in Stevenson screen recorded at 8 a.m. on that day being 65°·5, and the max. 78°. This reading is unprecedented in 12 years.

METEOROLOGY IN BELGIUM.

It is nearly two years since M. Folie resigned the appointment of Director of the Brussels Observatory. It is rather more than a year since we epitomized (*Met. Mag.*, Vol. XXXII. p. 91) some articles in *Ciel et Terre*, dealing with the subject.

We are very glad to announce that by Royal decree, dated Sept. 2nd, 1898, the work of the observatory has been divided. All subjects of finance, maintenance of buildings, library, and what may be called business matters, are placed under Professor Goedseels as "Administrateur-inspecteur." M. C. Lagrange has been appointed Scientific Director, Astronomical Department; and M. A. Lancaster Scientific Director, Meteorological Department. We congratulate both these gentlemen on the well-earned public recognition of their services, and we hope that such funds may be placed at their disposal that the work of both departments may speedily be brought up to date and kept there.

THE EFFECT OF LIGHTNING ON AN OAK TREE.

To the Editor of the Meteorological Magazine.

SIR,—Charlton Kings (Gloucestershire) was visited by three very severe thunderstorms on August 15th, 18th and 21st respectively. On September 4th I first noticed that a fine oak tree growing on the bank of a narrow stream or ditch in that parish was blasted, and the leaves over the whole of the upper two-thirds of it burnt and curled up.

On examining the tree I found two grooves cut out of the bark on opposite sides of the main stem; each passed downwards (as I found by probing) beneath the surface of the soil, and continued upwards, quite distinct from each other, to where the tree bifurcated at about 20 feet from the ground, thence each groove continued upwards, following respectively one of the principal leaders to its very top. There were thus from the top to the ground two entirely separate cuts. That on the north had removed the bark for its whole depth to the width of about 1½ inch, some shreds hanging detached, which were quite brittle but showed no appearance of scorching. The groove on the south side was slightly wider and of similar appearance, with one remarkable exception—that a further groove, about one inch wide, was cut out of the wood down the middle of the groove in the bark.

Whether the tree was struck by two flashes with such corresponding results, or whether one flash so entirely separated itself into two as to produce such results, the case seems sufficiently remarkable to deserve recording.

The tree stands about half-a-mile to the north of, and 550 feet below the top of, Leekhampton Hill. I am inclined to think from my observations of the three storms that this occurred during the last, but I have no evidence on the point.

JAMES G. WOOD, M.A., F.R.Met.Soc.

115, Sutherland Avenue, W., Sept. 9th, 1898.

THE AURORA OF SEPTEMBER 9TH, 1898.

[Although we believe that this is not the time when such a phenomenon ought to have occurred, an exceptionally large spot upon the sun came into view in the early days of September, and about the date at which it became central on the sun's disc there was (as usual) a very fine aurora. We have room only for two accounts, which we have selected, one, because of the accurate details which it contains—the other because of the great experience of the writer. It was seen from almost all parts of the British Isles, and indeed from most parts of the North West of Europe. Several pages of *Ciel et Terre* are devoted to accounts of the appearance in different parts of Belgium, one of them, illustrated by a sketch, showing the appearance at 21h. 50m. (8.50 p.m.), the time of greatest brilliancy. We shall not be surprised to hear of Aurora

Australis having been seen at the same time. We have seen no account of the previous appearance of this spot, but notices of an aurora on August 16th have been published. As the rotation period of the sun is about 25 days, it follows that (August 16 + 25 =) Sept. 10 would be the theoretical date, and the 9th was not very far off.

It has been said that Auroræ produce unsettled and stormy weather—certes that has not been the case in the S.E. of England this time.—ED.]

To the Editor of the Meteorological Magazine.

SIR,—8.25 p.m.—Strong patches of white light noticed due north and to the west and east of north—that in the north-east the strongest.

8.30.—The patches widened out and formed into an arc, with a depression nearly in the centre, the upper edge of the band fairly well defined, but the lower edge much broken by what appeared to be the upper edge of cumulus; but this proved not to be such, for whenever the brilliancy above faded, stars could be seen in the darker space below, and when finally the display ceased, there were no clouds in the sky but a few fleecy ones of small extent. During the whole time some principal stars were visible through the arc of light.

8.32.—A brilliant meteor shot from east to west horizontally across the northern sky, almost tangentially to the arc of light.

8.35.—Streamers began to shoot upwards, principally from the extremities of the arc.

8.40.—The streamers in the N.E. became slightly pink.

8.45.—The base of the arc determined to subtend an angle at the horizon of 135°, of which 80° were to the west and 55° to the east of due north. The depression remained uniformly in the middle of the arc. The streamers, now very clearly defined, were not productions of radii of arc, but converging towards the zenith, which they nearly reached, presenting the appearance of the ribs in the groined roof of an apse.

8.55.—A brilliant pink and broad streamer from the extreme west of the arc assumed and retained for some minutes the form of a fluted spiral column.

9.5.—The arc suddenly contracted itself so that its base subtended an angle of 110° only, the depression at the same time disappearing and the arc becoming regular throughout. Directly this was established only one streamer was visible—a broad, pink band, sloping from the vertical slightly to the right, and stretching well above the Pole Star, which was seen exactly in the centre of the band. This band distinctly moved eastward, for without changing its form or width, its western edge gradually approached, and in about two minutes passed eastwards of, the Pole Star.

For some minutes there was a constant variation in the position and number of the streamers and little or no colour, but all streamers

now assumed the direction of radii of the circle of which the arc was part.

9.15.—Two strong flickers of light like "sheet" lightning were succeeded by the fading out of all the streamers and a diminution of the "arc" light; but the aurora did not entirely disappear for some hours. At 10 o'clock it looked like a luminous haze or cloud over the water.

The weather preceding this display has been remarkable all over England, and will, no doubt, be fully recorded. A few notes of the local conditions may be useful:—

Sept. 7th.—Intensely hot day. Somewhat cloudy in afternoon. Hazy, with electrical clouds in the offing.

Sept. 8th.—Thick mist in the morning, cleared by midday under a hot sun; but about 5 p.m. clouds of mist rolled in from the sea and enveloped from time to time even low hills. Still very warm.

Sept. 9th.—Cloudy morning, with fresh wind from S.E. Sun broke through at times, and very hot. 2.30 to 3.30 p.m., drizzling fine rain or Scotch mist from S.W., afterwards cloudy and threatening. Clouds on hills at 700 feet level. Just before sunset temperature fell considerably, with a little rain. The clouds then lifted regularly all along the western and northern horizon just enough to show the sun setting a brilliant yellow into the ocean, without any bank of clouds. Lundy Island and the coast of Glamorganshire became suddenly visible, and so remained until it was dark. At 10 p.m. the wind had veered to N., and barometer, which before was falling, had risen ·1 since 6 p.m. Stars brilliant, and the lights on Welsh coast very distinct.

JAMES G. WOOD, M.A., F.R.Met.Soc.

Ilfracombe, Devon, September 9th, 1898.

To the Editor of the Meteorological Magazine.

SIR,—On Friday last, September 9th, an aurora was well observed here, which was probably the most brilliant, if not the most highly-coloured which has been seen since August 12th, 1880, not to go further back to the grand displays of 1847 and 1870–1871. It was preceded by a magnificent sunset, the sky carmine to the zenith, and fine masses of clouds to the eastward being illumined with a pink light similar to that of snowy Alpine peaks, changing later to a deep copper shade.

At 9 p.m. a large arch was seen spanning the northern horizon, a little to the west of north and at an altitude of about 20°. The centre was dark and apparently transparent. Streamers were continually shooting upwards for fully 60° in height.

The light given out was equal to that of a full moon, and was generally white, although with a tint of red occasionally. After midnight the exhibition gradually died away.—Yours, &c.,

HENRY SOUTHALL, F.R.Met.Soc.

The Graig, Ross, September 12th, 1898.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

SEPTEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
						Highest Month.		Lowest Month.		Highest.		Lowest.			
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.	Mean of all Highest	Mean of all Lowest.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·970	30·255	29·757	9 a.m.	29·971	30·260	1865	29·747	1859	30·532	16th, 1870	28·731	25th, 1896	30·398	29·438
		1865	1859	9 p.m.	29·970	30·250	1865	29·766	1896	30·523	12th, 1888	28·959	22nd, 1863	30·376	29·465
Shade Temp. Dry Bulb	56·8	61·8	53·2	9 a.m.	58·1	63·9	1865	54·7	1877	77·0	8th, 1865	43·1	27th, 1861	66·5	49·0
		1865	1877	9 p.m.	55·6	59·7	1865	51·7	1877	71·8	4th, 1880	39·5	21st, 1872	64·1	46·9
Shade Temp. Max.	67·3	..	...	...	...	76·4	1865	62·8	1887	91·0	7th, 1868	50·1	24th, 1872	77·1	58·2
Shade Temp. Min.	49·7	...	...	...	...	54·5	1865	45·6	1863	64·2	5th, 1880	33·0	23rd, 1872	59·4	39·1
Shade Temp. Wet Bulb	54·0	58·0	50·3	9 a.m.	54·7	59·1	1865	51·1	'77, '87	67·5	8th, 1865	40·8	26th, 1885	62·6	46·5
		1865	1877	9 p.m.	53·4	56·8	1865	49·5	1877	67·0	6th, 1866	37·3	21st, 1872	61·7	44·8
Solar Rad., black	102·0	...	...	...	...	108·7	1872	93·6	1894	131·8	13th, 1872	55·6	29th, 1871	120·4	70·4
Solar Rad., bright	75·7	...	...	...	...	82·6	1895	71·6	1894	93·3	12th, 1889	56·2	21st, 1880	86·8	61·4
Grass Minimum	45·4	...	..	...	...	49·2	'65, '71	41·3	1863	62·3	6th, 1861	27·7	30, '63; 27, '85	56·8	31·1
Soil, 1 foot	57·5	...	...	...	...	60·3	1875	55·4	1877	65·8	5th, 1880	49·4	28th, 1885	61·0	53·3
Cloud	5·6	7·1	2·1	9 a.m.	5·9	7·9	1881	2·3	1865	10	Every year	0	Various	10·0	0·2
		1869	1865	9 p.m.	5·3	7·7	1864	1·8	1865	10	Every yr. but '65	0	Various	9·9	0·0
Rainfall	2·39	5·51	·55	9 a.m.	1·26	3·32	1885	·17	1890	1·24	6th, 1895	·00	Every year	·50	·00
		1896	1865	9 p.m.	1·13	2·78	1896	·04	1895	·96	29th, 1871	·00	Every year	·38	·00

Max. Rainfall in 24 hours, 1·66 in., 26th, 1859. Mean max. daily fall, ·69 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	66·5	8	28·9	6	58·0	39·9	39·0	77	109·9	23·5	1·01	12	5·4
Malta	77·6	1	48·3	6	68·5	56·0	54·0	85	149·6	42·5	1·95	5	5·3
Cape of Good Hope	81·5	22	38·0	7	68·0	53·0	51·4	82	...	...	3·37	8	2·6
Mauritius	84·6	4	68·3	2	81·9	73·6	69·3	78	133·6	61·4	4·32	20	6·6
Calcutta	103·4	8	67·8	13	94·4	76·2	72·5	68	157·2	64·3	1·04	4	2·1
Bombay	92·2	3	75·0	9	89·2	78·7	74·6	74	143·5	66·7	·00	0	1·9
Ceylon, Colombo	94·2	1	73·3	12	89·8	76·2	74·6	81	157·5	69·5	22·81	24	6·6
Melbourne	85·9	1	41·2	21	67·3	50·3	47·6	68	138·9	36·3	1·68	12	5·9
Adelaide	85·7	13	45·0	24	70·3	52·9	48·9	65	144·8	34·6	3·41	13	5·8
Sydney	83·0	3	48·5	22	64·5	57·3	51·1	73	132·3	38·7	·58	9	4·6
Wellington	71·6	3	41·0	20*b*	63·3	51·2	49·9	76	124·0	30·0	5·63	12	4·7
Auckland	74·0	14	45·0	24	67·6	54·6	51·8	72	133·9	42·0	·97	8	4·7
Jamaica, Kingston	88·9	9	67·3	4	85·9	69·7	66·9	74	...	...	·17	4	4·2
Trinidad	92·0	28*a*	62·0	16	88·7	68·6	69·6	74	165·0	61·0	1·17	8	...
Grenada	86·0	29	71·8	11	83·6	73·7	66·7	65	148·0	...	1·66	12	2·0
Toronto	67·1	15	15·7	5	51·5	35·2	29·1	58	87·0	11·8	1·70	7	4·7
New Brunswick, Fredericton	60·7	12	3·6	5	47·7	28·1	24·3	59	...	...	4·23	11	6·0
Manitoba, Winnipeg	68·5	14	−9·0	1	51·3	25·3	...	...	...	...	·98	5	4·7
British Columbia, Esquimalt	66·2	30	30·4	2	55·4	38·2	40·0	81	...	...	·88	10	5·9

a—and 29. *b*—and 24.

REMARKS.

MALTA.—Mean temp. 60°·0, or 0°·4 above the average. Mean hourly velocity of wind 12·7 miles, or 1·1 above the average. Mean temp. of sea 62°·0. T8 on 29th; L on 4th. J. F. DIBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 1°·1 above, and rainfall ·67 in. below, their respective averages. Mean hourly velocity of wind 14·0 miles, or 3·3 above average; extremes, 29·7 on 9th and 2·0 on 30th; prevailing direction E.S.E. and E. by S. L and T on 23rd. A. WALTER.

CEYLON, COLOMBO.—Mean temp. of air 82°·3, or 0°·4 above, of dew point 0°·4 above, and rainfall 11·75 in. above, the average. T8S on 16 days; L on 3 days. H. O. BARNARD.

Adelaide.—Mean temp. 2°·5 below, and rainfall 1·66 in. above, their respective averages for 41 years. C. TODD, F.R.S.

Sydney.—Temp. 0°·1 below, humidity 4·9 below, and rainfall 5·00 in. below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—The early part of the month was stormy from N.W., then followed fine weather until the middle of the month, when rain came on, and it continued showery until the 24th; the last part was fine. T8 on 21st; fog on 17th. Temp. 0°·2 above, and rainfall 2·10 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually dry April, the rainfall being considerably less than one-third of the average. Mean temp. slightly under the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 2·1 miles. Rainfall one-sixth of the average. The Island rainfall for the month is about the average. R. JOHNSTONE.

TRINIDAD.—Rainfall ·86 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·46	XI.	Builth, Abergwesyn Vic.	2·37
II.	Dorking, Abinger Hall .	1·01	,,	Rhayader, Nantgwillt ...	1·84
,,	Birchington, Thor	·43	,,	Lake Vyrnwy	2·32
,,	Hailsham	1·03	,,	Corwen, Rhug	1·77
,,	Ryde, Thornbrough	1·00	,,	Criccieth, Talarvor	2·38
,,	Emsworth, Redlands ...	1·73	,,	I. of Man, Douglas	2·47
,,	Alton, Ashdell	1·04	XII.	Stoneykirk, Ardwell Ho.	4·22
III.	Oxford, Magdalen Col..	·34	,,	New Galloway, Glenlee	4·13
,,	Banbury, Bloxham	1·07	,,	Moniaive, Maxwelton Ho.	3·46
,,	Northampton, Sedgebrook	·48	,,	Lilliesleaf, Riddell	1·32
,,	Stamford Duddington...	·36	XIII.	N. Esk Res. [Penicuick]	4·25
,,	Alconbury	·20	XIV.	Glasgow, Queen's Park..	3·99
,,	Wisbech, Bank House...	·20	XV.	Inverary, Newtown	10·14
IV.	Southend	·17	,,	Ballachulish, Ardsheal...	9·60
,,	Harlow, Sheering..... ...	·24	,,	Islay, Gruinart School ...	3·50
,,	Colchester, Lexden	·32	XVI.	Dollar.....	6·58
,,	Rendlesham Hall	·44	,,	Balquhidder, Stronvar...	7·39
,,	Scole Rectory	·21	,,	Coupar Angus Station...	2·33
,,	Swaffham	·26	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·88	XVII.	Keith H.R.S.....	2·86
,,	Bishop's Cannings	·98	,,	Forres H.R.S.	2·82
,,	Blandford, Whatcombe .	1·31	XVIII.	Fearn, Lower Pitkerrie..	3·96
,,	Ashburton, Holne Vic...	1·53	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	1·26	,,	Invergarry	4·27
,,	Hartland Abbey	1·75	,,	Aviemore H.R.S.	3·89
,,	Lynton, Glenthorne ...	1·60	,,	Loch Ness, Drumnadrochit	2·76
,,	Probus, Lamellyn	1·22	XIX.	Inversbin	3·82
,,	Wellington, The Avenue	1·26	,,	Durness	5·21
,,	North Cadbury Rectory	1·55	,,	Watten H.R.S.....	2·85
VI.	Clifton, Pembroke Road	1·30	XX.	Dunmanway, Coolkelure	6·22
,,	Ross, The Graig	·46	,,	Cork, Wellesley Terrace	2·79
,,	Wem, Clive Vicarage ...	·69	,,	Killarney, Woodlawn ..	4·71
,,	Wolverhampton, Tettenhall	·56	,,	Caher, Duneske	3·50
,,	Cheadle, The Heath Ho.	1·00	,,	Ballingarry, Hazelfort...	3·13
,,	Coventry, Priory Row ..	·65	,,	Limerick, Kilcornan ...	2·95
VII.	Grantham, Stainby	·59	,,	Broadford, Hurdlestown	3·88
,,	Horncastle, Bucknall ...	·40	,,	Miltown Malbay	3·59
,,	Worksop, Hodsock Priory	·52	XXI.	Gorey, Courtown House	2·01
VIII.	Neston, Hinderton	1·33	,,	Athlone, Twyford	3·21
,,	Southport, Hesketh Park	1·48	,,	Mullingar, Belvedere ...	3·75
,,	Chatburn, Middlewood.	1·24	,,	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	·60	XXII.	Woodlawn	3·14
,,	Scarborough, Observat'y	·16	,,	Crossmolina, Enniscoe ..	2·95
,,	Middleton, Mickleton ...	·88	,,	Collooney, Markree Obs.	3·23
X.	Haltwhistle, Unthank...	·90	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	·63	XXIII.	Warrenpoint.....	3·66
,,	Duddon Valley, Ulpha School	4·00	,,	Seaforde.....	3·62
,,	Keswick, The Bank.....	2·14	,,	Belfast, Springfield	4·09
XI.	Llanfrechfa Grange	2·60	,,	Bushmills, Dundarave..	5·06
,,	Llandovery	1·63	,,	Stewartstown	5·16
,,	Castle Malgwyn	1·63	,,	Killybegs	4·38
,,	Brecknock, The Barracks	·71	,,	Horn Head	4·01

SEPTEMBER, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	In shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square)	·33	— 2·18	·20	29	4	91·2	8	36·8	29	
II.		Tenterden	·77	— 2·14	·41	29	6	88·0	9	37·0	29	
,,		Hartley Wintney	·82	...	·71	29	5	89·0	8	44·0	28	
III.		Hitchin	·31	— 2·19	·27	29	3	90·0	8	34·0	23*b*	
,,		Winslow (Addington)	·41	— 2·26	·31	29	4	91·0	8	30·0	26	
IV.		Bury St. Edmunds (Westley)	·20	— 2·50	·11	29	4	81·0	8	41·0	29	
,,		Norwich (Brundall)	·17	...	·10	18	4	89·0	9	35·7	29	
V.		Winterbourne Steepleton	1·80	...	1·36	29	7	81·0	7	31·1	25	
,,		Torquay (Cary Green)	·80	...	·58	29	6	76·3	8	46·2	29	
,,		Polapit Tamar [Launceston]	1·71	— 2·00	·59	17	12	80·6	6	35·3	1, 26	
VI.		Stroud (Upfield)	·78	— 2·13	·61	29	6	83·0	8	40·0	24	
,,		ChurchStretton(Woolstaston)	·60	— 1·90	·30	29	7	81·0	7	40·0	24*b*	
,,		Worcester (Diglis Lock)	·61	— 1·83	·50	29	6	...	..	...	...	
VII.		Leicester (Rotherby Hall)	·42	...	·37	29	3	86·0	18	28·0	29	
,,		Boston	·27	— 2·50	·20	29	3	90·0	8	35·0	29	
,,		Hesley Hall [Tickhill]	·51	— 1·65	·41	29	5	87·0	17	34·0	29	
VIII.		Manchester(PlymouthGrove)	·54	— 2·93	·16	29	8	85·0	5, 7	36·0	24	
IX.		Wetherby (Ribston Hall)	1·13	— 1·33	·90	29	5	...	...	...	...	
,,		Skipton (Arncliffe)	3·03	— 1·73	·91	29	14	...	...	...	...	
,,		Hull (Pearson Park)	·26	— 2·18	·18	29	3	85·0	17	37·0	28*c*	
X.		Newcastle (Town Moor)	·61	— 2·17	·30	7	5	...	..	...	...	
,,		Borrowdale (Seathwaite)	10·98	— ·75	2·29	29	16	...	...	...	...	
XI.	WALES.	Cardiff (Ely)	2·57	— 1·17	1·48	29	9	...	...	...	...	
,,		Haverfordwest	2·03	— 2·37	·75	29	9	77·0	6	37·7	26	
,,		Aberystwith (Gogerddan)	2·04	— 2·23	·98	29	7	82·0	5, 7	...	...	
,,		Llandudno	1·56	— ·66	·51	29	9	81·0	5*a*	43·0	25	
XII.	SCOTLAND.	Cargen [Dumfries]	3·33	— ·23	·86	29	9	80·0	6	35·0	29	
XIII.		Edinburgh (Blacket Place)	2·21	...	·75	29	14	82·8	5	39·2	24	
XIV.		Colmonell	3·92	...	·94	29	15	83·0	4	34·0	24	
XV.		Tighnabruaich	7·54	...	1·44	1	18	71·0	6	41·0	24	
,,		Mull (Quinish)	7·05	+ 2·02	1·11	27	20	...	...	...	...	
XVI.		Loch Leven Sluices	3·60	+ ·81	1·60	30	11	...	...	...	...	
,,		Dundee (Eastern Necropolis)	1·95	— ·56	1·05	29	15	82·9	4	38·0	23	
XVII.		Braemar	2·53	— ·33	·49	8	15	80·0	4	29·8	23	
,,		Aberdeen (Cranford)	1·62	...	·60	1	15	82·0	4	32·0	18	
,,		Cawdor (Budgate)	3·34	+ ·59	·54	1	13	...	...	...	...	
XVIII		Strathconan [Beauly]	4·61	+ ·93	·80	30	10	...	...	..	...	
,,		Glencarron Lodge	9·43	...	1·22	1	21	80·6	6	34·0	25	
XIX.		Dunrobin	3·84	+ 1·25	·70	29	13	73·0	6	39·0	19	
,,		S. Ronaldshay (Roeberry)	4·74	+ 2·08	·98	3	18	71·0	5, 6	43·0	19	
XX.	IRELAND.	Darrynane Abbey	5·23	...	1·20	8	19	...	...	...	...	
,,		Waterford (Brook Lodge)	2·69	— ·23	·70	26	13	75·0	15	37·0	28	
,,		O'Briensbridge (Ross)	3·93	...	·77	8	14	...	...	...	...	
XXI.		Carlow (Browne's Hill)	2·20	— ·62	·62	8	14	...	...	...	...	
,,		Dublin (FitzWilliam Square)	1·45	— ·52	·52	8	13	77·8	6	43·0	25	
XXII.		Ballinasloe	3·34	+ ·55	·64	7	19	74·0	4, 5	40·0	29	
,,		Clifden (Kylemore)	5·57	...	1·17	28	16	...	...	...	...	
XXIII		Waringstown	5·79	+ 2·63	1·42	27	15	82·0	7	37·0	22	
,,		Londonderry (Creggan Res.)	4·21	+ ·43	1·36	29	20	...	...	...	...	
,,		Omagh (Edenfel)	4·12	+ ·74	·94	27	16	80·0	4	35·0	20	

+ Shows that the fall was above the average; — that it was below it.

a—and 6, 16. *b*—and 25. *c*—and 30.

METEOROLOGICAL NOTES ON SEPTEMBER, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The R of the twelve months ending September, is only 18·08 in. being the least in 35 years and ten inches less than the average, and the fall in July, August and September is only 2·68 in., there having been only three other years with less than five inches in that period. Only four other years have had less than one inch in September, 1865, 1886, 1891 and 1895. There were 9 days with max. temp. above 80°, but the mean max. temp. is 1°·5 lower than that of September, 1895. Duration of sunshine 234 hours; on 4th 11 hours 30 min., and on 16th 11 hours 25 min. were registered. Partial drought for 40 days with ·37 in. of R ended on 17th.

HARTLEY WINTNEY.—Another remarkable month for great heat and drought. The driest September since 1890, making, with the two preceding months, a very long and severe drought. Mean max. temp. 75°·6, mean min. 55°·5. Aurora visible on 9th. Remarkably clear and starlight nights until 29th. Frosts on the last 8 days. Ozone on 8 days. R of the first 9 months of the year 7·76 in. below the average. R for September 1·31 in. below the average.

WINSLOW, ADDINGTON.—In no other September since observations began in 1871 has there been so small a rainfall or a continuance of weather so exceptionally hot. There were two hot periods, the first from 3rd to 9th, giving 7 consecutive days with temp. of 80°, or above, and an average max. of 83°; the second from 14th to 17th, 4 consecutive days, with 80° and upwards, making a total of 11 days above 80°; equalled since 1871 only in July, 1887. Towards the end the nights were cold.

BURY ST. EDMUNDS, WESTLEY.—The month was very dry and hot, being the driest September since 1865, when only ·11 in. of R fell. Water is very scarce in many villages in West Suffolk, and the outlook for winter sheep feed is very bad. Grand aurora on 9th.

NORWICH, BRUNDALL.—The warmest and driest September recorded here, the 9th being the hottest day since August 8th, 1893. Aurora on 9th.

WINTERBOURNE STEEPLETON.—Unusually hot and dry. Mean temp. 57°·9. The max. 81° on 7th was equalled only on August 15th. The weather was remarkably fine almost throughout, which intensified the effect of the absence of R. Until the last week of the month, there had been no week with an inch of R since May 21st, and there had been four rainless weeks. H and T on 28th.

TORQUAY, CARY GREEN.—R 1·62 in. below the average. Mean temp. 61°·8, or 3°·9 above the average. Duration of sunshine 213 hours 25 min., or 55 hours 40 min. above the average; no sunless day.

POLAPIT TAMAR.—A very dry month. The first 16 days were generally very hot and dry, with only ·10 in. of R. Easterly winds or breezes prevailed.

WOOLSTASTON.—Very dry, and for the first three weeks intensely hot and sultry, followed by a few bitterly cold days, with sharp frosts on the ground. Want of water was much felt, the streams and brooks having almost disappeared. Mean temp. 59°·8.

MANCHESTER, PLYMOUTH GROVE.—Fine summer weather from 4th to 9th and 15th to 17th and on the whole, fine Autumn weather during the remainder. The driest September in the 31 years recorded. Mean temp. 55°·5.

NEWCASTLE, TOWN MOOR.—The smallest monthly rainfall recorded in September since 1895 when ·44 in. fell on 5 days.

WALES.

HAVERFORDWEST.—One of the finest, driest, and warmest Septembers on record. There were 9 days on which the temp. rose to 70°, or above, and much more than the average of brilliant sunshine. From 24th to 30th there was a considerable fall of temp., with E. and N.E. winds and cold nights. A

gale of some violence occurred on 29th with heavy R. Crops were good and well saved and there was plenty of grass in most places. R from January 1st to September 30th only 24·15 in.

GOGERDDAN.—A very fine September after a very wet August. Plenty of grass and good root crops.

SCOTLAND.

CARGEN [DUMFRIES].—Although the mean temp. of the month has been four times exceeded in 39 years, the average of the six days 3rd to 8th (66°·3) is unprecedented. A sudden change to lower temp. occurred on 22nd and continued until the close, the mean from 22nd to 30th being 48°·7, while from 1st to 21st it was 60°·3. On seven days the max. temp. exceeded 70°. The max. temp. (80° on 6th) has only once been exceeded, namely, on September 4th, 1880, when 80°·4 was registered. Of the 3·33 in. of R, 2·24 in. fell on 11th, 17th and 29th. The total R for the nine months of the year is 1·09 in. above the average. Duration of sunshine 17 hours above the average. Pastures were never more luxuriant.

EDINBURGH, BLACKET PLACE.—The heat wave lasted from the 2nd to the 17th, the mean temp. being 63°·3, or 8°·2 above the average of the period for 100 years. On 4th, 5th and 6th the shade temp. exceeded 80° each day, and the mean temp. was 70°·7, or 14°·7 above the normal. Rainfall 24 per cent. below the average, and sunshine slightly below the normal. The min. temp., 62°·0 on 3rd, is the highest in September for 57 years; and the max., 82°·8 on 5th, is the highest in September since 1838. The mean min. temp. for the week ending 9th is 59°·8. L on 7th. Brilliant aurora on 10th.

COLMONELL.—R ·10 in. below, and mean temp. 3°·8 above, the average of 22 years. Very brilliant aurora on 9th.

TIGHNABRUAICH.—The rainfall was excessive and very bad for harvest operations. Mean temp. 3° above that of September, 1897.

MULL, QUINISH.—Very warm and wet, with the wind from S.E. to S.W. continuously.

ABERDEEN, CRANFORD.—Charming weather throughout, and very warm. Water in many places very scarce. Brilliant aurora on 9th.

S. RONALDSHAY, ROEBERRY.—Warm and wet. Mean temp. 53°·7, or 2°·2 above the average of 8 years.

IRELAND.

WATERFORD, BROOK LODGE.—Aurora at night on 9th. Much L at night on 16th. T and H on 28th.

O'BRIENSBRIDGE, ROSS.—With a full rainfall there were many fine, bright days. Altogether a favourable harvest month. Brilliant aurora on 10th.

DUBLIN, FITZWILLIAM SQUARE.—A warm, dry, summer-like month. Mean temp. 60°·2, being 4°·4 above the average, but 1°·2 below that of the wonderful September of 1865. High winds on 9 days, reaching the force of a gale on 18th, 29th and 30th. Fog on 4th, 15th and 25th. Solar halos on 7th and 8th, lunar halos on 28th and 30th. L on 16th. Magnificent aurora on 9th. R for the nine months ending September 30th 17·97 in.

WARINGSTOWN.—The wettest September on record, but a wonderfully good harvest.

OMAGH, EDENFEL.—Notwithstanding a rainfall about one-fourth above the average, and 16 rainy days, the month was the finest September recorded, surpassing even those of 1868 and 1893. The R mostly fell at night, and with temp. on seven days above 70°, and on the 4th as high as 80° (a point never before reached in September), a large proportion of the days were as perfect as weather could be, the atmosphere being frequently remarkably clear. Harvest correspondingly excellent.

No. CCCXCIV.] [PRICE FOURPENCE.
VOL. XXXIII. *Or 5s. per annum post free.*

WORK LIBRARY

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE
The British Association at Bristol, 1898	145
Wragge's Australasian Weather Guide	151
Lunar Rainbow	152
The Drought	153
The Effect of Lightning on an Oak Tree	154
Some Heavy Rains—October 15th–18th, 1898	154
Results of Meteorological Observations at Camden Square during October for 40 years, 1858–97	155
Climatological Table for the British Empire, May, 1898	156
Supplementary Table of Rainfall, October, 1898	157
Rainfall and Temperature in October, 1898, at 50 Stations	158
Meteorological Notes on October, 1898	159

NOVEMBER, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZ

CCCXCIV.] NOVEMBER, 1898. [PRICE F
or 5s. per an

THE BRITISH ASSOCIATION AT BRISTOL, 18

WE have added the date to the above title because we have (Vol. X., p. 117 *et seq.*) chronicled one Bristol meeting, and must not be confusion between the meetings of 1875 and of 1

Although the total number of persons attending the recent m was considerably above that in 1875, the number of meteoro present was about the same as in that year.

The majority of the papers were taken in Section A (*Pres* Prof. Ayrton, F.R.S.), and on the Saturday, but a few were tak E (Geography).

Report of the Committee on the Climate of Tropical Africa.

This report contained, as usual, abstracts of observations various stations, which had been received by the Committee; was noteworthy in that the Committee appear to have decided in future, observers must provide their own instruments. S large organizations for the collection of meteorological data in C Africa having been started, the pioneer work of this Comm seems to have brought forth excellent fruit, the credit of wh largely due to the Chairman, Mr. E. G. Ravenstein, F.R.G.S to Mr. H. N. Dickson, the Secretary.

Report of the Committee on Ben Nevis Observatory.

The Committee was appointed, as in former years, for the pu of co-operating with the Scottish Meteorological Society in m meteorological observations at the two Ben Nevis Observatorie

The hourly eye observations by night as well as by day, whi a speciality of the Ben Nevis Observatory, were made with con regularity during the year 1897 by Mr. Angus Rankin, the intendent, and his assistants.

As stated in our last Report, the observations at the interm station on Ben Nevis, at a height of 2,322 feet, were resumed i summer months. The observations were made from July 1 September 30th, by Messrs. T. S. Muir of the Royal Hill Sch Edinburgh, Alexander Drysdale, B.Sc., Dollar, and A. Aitken

the great enthusiasm and self-denial of the observers, aided by several self-recording instruments the gift of Mr. J. G. Buchanan, a valuable, complete series of hourly observations has been obtained. Hence, for the first time, complete series of hourly observations have been secured at heights of 42 feet, 2,322 feet, and 4,407 feet, the three places being in the same line, and differing but little in horizontal distance from each other. These hourly observations from the three Observatories on Ben Nevis are really indispensable data in investigating the problems relating to the vertical gradients of the temperature, pressure, and humidity of the atmosphere and its movements.

Messrs. Muir and Drysdale have undertaken, under the superintendence of the Directors, the laborious work of discussing these observations, and at the Meeting of the Scottish Meteorological Society, Mr. Muir submitted an exhaustive preliminary report. Among the important results either disclosed or indicated in the discussion, may be noticed the relations which prevail between different vertical distributions of temperature and pressure on the one hand, and cyclones and anticyclones on the other, thus :— When the reduced barometer at the Ben Nevis Observatory, for a series of observations, comes out higher than that of Fort William, then the accompanying disturbance of temperature takes place in the lower half of the mountain, that is, below the intermediate station, and denotes the approach of an anticyclone. Conversely, when the reduced Ben Nevis Observatory barometer reads lower than that of Fort William, then the disturbance of temperature takes place in the upper half of the mountain, and denotes the approach of a cyclone.

In the further prosecution of this line of research, it has been arranged that in the summer of 1898, in addition to the hourly observations, the observers make out-door temperature and eye observations at different heights above and below the level of the intermediate station. The observer takes with him a dry and a wet bulb sling thermometer with which the temperature and humidity are observed. Special attention is given to the particular height where at the time the more rapid changes of temperature and humidity occur, which are such striking features on the slopes of Ben Nevis, of the cyclones and anticyclones as they sweep past the mountain These observations will continue to be made for some time at short intervals, to which are added eye observations, such as mist and haze as they appear or disappear ; of marked changes of wind, both direction and force ; of the heights of the clouds on the neighbouring heights and mountains, of the rainfall, &c.

Mr. Omond has undertaken a discussion of the hourly observations at the three observatories, carried out in sequence from day to day, with the view of ascertaining, among other points, the times which elapse between the first appearance of the indications of a cyclone or anticyclone, and its actual arrival in the British Islands.

Report of the Committee on Meteorological Photography.

Mr. A. W. Clayden stated that the work of previous years on the photographic determination of cloud altitudes had been continued, using two cameras, one at each end of an east-west line 200 ft. long, and taking simultaneous photographs of clouds near the sun, each negative containing an image of the sun itself. The results show the existence of greater cloud altitudes in hot weather under thunderstorm conditions than at other times. In such circumstances clouds may occur at five or six different levels, extending as high as 17 miles. Alto-cumulus and cirro-cumulus clouds are much higher at the margins of anticyclones than generally supposed. A rise of cloud planes takes place in hot weather, also during the morning and early afternoon, while the lowest altitudes are found during cyclones. The Committee purpose to move the present installation to a neighbouring site, with a north to south base, so that observations may be taken in the early morning and late afternoon.

In the discussion which followed, Mr. G. J. Symons reminded the Section that the Committee would be glad to receive any photographs of exceptional meteorological phenomena.

Report of the Committee on Seismological Investigations.

A voluminous report on this subject was presented by Professor John Milne. It showed the great progress made by the establishment of earthquake-observing stations round the world, and some of the results of the observations made. There was an interesting chapter on the effect of earthquake disturbances on magnetic instruments. It was found that when a great earthquake has originated, for example, in Japan, seismographic records indicate that about 16 minutes later Europe has felt the shock, and it might be imagined that one observatory has practically been subjected to as much movement as any other. The effect on magnetic needles at various observatories has, however, been very different. This could be accounted for in various ways, which were discussed at length. To explain the fact that magnetic storms and perturbations often precede large earthquakes and appear rarely to precede small ones, we may assume that the earthquake is preceded by chemical, physical, or mechanical changes in the constitution of the materials where it originates. All that we are certain about is, that with many earthquakes there have been enormous mechanical displacements of material, sufficiently large to disturb the Pacific Ocean for a period of twenty-four hours. Other earthquakes from submarine centres which have not disturbed oceans, but have created equally large earth waves, indicate equally large subterranean reliefs in strain, and material readjustments. These large earthquakes, originating beneath the bottom of the steeper slopes of the earth's surface, suggest that at such places a secular flow in subterranean material may be in progress, accelerations in which result in violent shaking,

which, as it radiates, is transformed into slow earth waves. Near to the scene of such subterranean changes, prior to and at the time of the same, magnetic perturbations should be observable. In Japan such appears to have been the case. In regard to the velocity with which preliminary tremors may be supposed to be transmitted through the earth, such data as have been collected apparently show that this varies with the square root of the average depth of the chord along which we may suppose them to have travelled. In conclusion, Prof. Milne showed photographs of many Continental seismological observatories, and contrasted the splendid provision made for seismological observations by Italy and Germany, with the damp and unhealthy stable which alone he was able to provide in the Isle of Wight.

Mr. G. J. Symons, F.R.S., said the absence of any provision by the Government for these important observations was disgraceful, and subsequently Professor Barrett moved and Mr. Symons seconded, "That the Committee of the Section be requested to consider the advisability of urging her Majesty's Government to place at the disposal of the Seismological Committee of the British Association a suitable building for housing the apparatus for continuous seismological observations." This was agreed to. In the course of the discussion great credit was given to Professor Milne for the enthusiastic and able way in which he conducted these investigations. One speaker thought that the result of the investigations was very important to geologists. If a vibration originating in Japan was so soon felt in Europe it would show that the earth was composed of very dense material, that the earth must be tolerably solid, and that the cavernous theory was not tenable. In proposing a vote of thanks, the President mentioned that Professor Milne was devoting his life to the solution of a problem which was of world-wide importance.

Report of the Committee for the Establishment of a Meteorological Observatory on the Top of Mount Royal, Montreal.

The Committee desire this year to present an *interim* report, and to ask for re-appointment, with a further grant of £50. The object of the establishment of the observatory on the top of the mountain was to obtain simultaneous records of temperature, humidity, &c., for comparison with those taken at the College Observatory at the foot. The distance between the two stations is rather more than a mile, and the difference of altitude nearly 600 feet. A line consisting of four insulated copper wires was erected to connect the two observatories. As a preliminary experiment, an electrical thermometer was set up on the wooden tower on the summit of the mountain, and connected through the line to a recording instrument in the College Observatory. No difficulty was encountered in obtaining continuous records of the temperature on the summit in this manner.

It is hoped that interesting results may be obtained by comparing continuous records of temperature at stations differing so considerably in altitude within a short distance of each other. The work has not yet progressed for a sufficient length of time to enable the Committee to report any general results, but the success of the method has been established, and it is intended, if possible, to extend further the method to the recording continuously at a distance of wind velocity and direction, barometric pressure and humidity. The intensity of sunshine has been recorded for some months at the observatory by means of similar instruments, and it is hoped to demonstrate the possibility of obtaining complete and accurate records of *all* necessary meteorological data from a distant observatory in a more or less inaccessible situation (such as that on the summit of Ben Nevis), without the necessity of employing a special observer to make daily visits to the station.

A Quantitative Bolometric Sunshine Recorder. *By* Professor H. L. Callendar, M.A., F.R.S.

This instrument is essentially a recording bolometer, in which the difference of temperature between a blackened and a bright platinum thermometer of equal resistance is recorded in pen and ink in the form of a continuous curve on a revolving drum. It differs from ordinary sunshine recorders in giving a strictly quantitative record of the quantity of heat received by the earth's surface, and not merely the number of hours of bright sunshine.

The sensitive part of the instrument, which is exposed to the radiation to be measured, consists of a pair of differential platinum thermometers wound on flat plates of mica, the one black and the other bright, and placed side by side in a horizontal plane so as to record the vertical component of the sunshine, on which the quantity of heat received by the surface of the earth mainly depends. The instrument gives a complete record of the character of the sunshine, as well as of its intensity. The passage of small clouds, which would leave no trace on an ordinary burning glass or photographic record, is very clearly shown. It is also found that, when the sky is obscured by clouds of sufficient thickness to prevent any trace of burning on the ordinary cards, a very considerable percentage of the sun's heat may still penetrate.

The recording apparatus used is identical with that required for records of temperature, pressure, voltage, &c., and may be located in any convenient situation, at any required distance from the bolometer. It has been in use for more than a year at McGill College, Montreal, for obtaining records of sunshine, temperature, &c., and has been in regular operation at a distance of more than a mile from the Observatory, where the recording apparatus is kept under the charge of the usual observatory assistants.

Exploration of the Upper Air by Means of Kites at Blue Hill Observatory, Mass., U.S.A. *By* DR. A. LAWRENCE ROTCH.

Since the account presented at Toronto great progress has been made. The Hargrave kite has been perfected by making it larger, more rigid, and relatively lighter, and by concaving the surfaces exposed to the wind the vertical component of the latter has been increased. In general, these kites, with a short line, rise from 50 to 60 degrees above the horizon, and pull about one pound per square foot of lifting surface in a wind blowing 20 miles an hour. Elastic bridles diminish the angle of incidence of the wind as its pressure increases, and thereby enable the kites to fly in gales. A meteorograph made by Mr. Fergusson, which records the pressure, temperature, and humidity of the atmosphere and the velocity of the wind, weighs but three pounds. Since the use of wire and more efficient kites, the mean height of the flights has been increased to more than 7,000 ft. during the past few months. On six occasions 10,000 ft. was reached, the *maximum* altitude attained being 11,440 ft. on August 26th, 1898.

Mr. Shaw remarked that it was a pity that this subject was not more taken up in England. Professor Boys said he had used kites both in Ireland and England, and had now one at the Victoria Rooms, which he should be glad to exhibit in suitable weather. The President suggested that Professor Boys should fly his kite at the garden party at Clifton College on Monday afternoon.

A new form of American kite by Professor SCHUSTER, F.R.S.

(No abstract received).

Analogies between the Yearly Ranges of some Meteorological and Magnetic Phenomena. *By* Dr. VAN RIJCKEVORSEL.

This is the second part of a paper read at the Toronto meeting, in which it was shown how similar the yearly temperature curves are for a large part of Europe, and how the anomalies which these curves show may contribute in a large degree to the discovery of their origin.

In the diagram accompanying the present paper are plotted down six annual curves for temperature, air-pressure, rainfall, magnetic declination, and for the vertical and horizontal components of the earth's magnetic force. A portion of these curves are for Greenwich, others for two different stations in the Netherlands. It is now shown that all these curves, however dissimilar in their general directions, are exactly alike in their anomalies. Except in a very small number of instances, where the data at hand were not yet sufficient to make the phenomenon appear, every maximum or minimum in one curve seems to have its exact counterpart in every other curve, be it meteorological or magnetic. This is even the case for very small accidents of a curve, so that it is probable that it will ultimately prove to be true for every single feature of these curves, however insignificant.

These facts, in the first place, show once more how all the phenomena on the earth must be, to a large extent, governed by one and the same potent cause. But they also seem to give a valuable method for discovering, if not always the cause of meteorological phenomena, yet of the centre on the globe from which such a cause emanates.

It is also shown how the cause of a certain minimum in the temperature curves, indicating a sudden cooling in the last days of June all over the British Isles and part of western Europe, what ever it may be, must have its seat to the west or north-west of the coast of Scotland, and at no great distance.

NEW YORK PUBLIC LIBRARY

The Rainfall of the South-Western Counties of England. *By* JOHN HOPKINSON, F.R.Met.Soc., Assoc.Inst.C.E.

The counties here considered as south-western are Monmouth, Hereford, Worcester, Gloucester, Wilts, Dorset, Somerset, Devon, and Cornwall. They cover an area of 11,273 square miles, which is between one-fourth and one-fifth that of England, and nearly one-tenth that of the British Isles. The mean monthly rainfall for the ten years 1881 to 1890 at 72 stations in these counties has been calculated, and the mean annual rainfall at 113 stations, being one to the nearest 100 square miles in each county. Thus, for example, the annual rainfall of the smallest county, Monmouth (496 square miles), is deduced from the records of five stations, and that of the largest, Devon (2,586 square miles), from the records of twenty-six stations.

The annual means at the 113 stations are :—

Monmouth	(5	stations)	36·19 in.
Hereford	(9	,,)	28·64 ,,
Worcester	(7	,,)	27·02 ,,
Gloucester	(13	,,)	29·39 ,,
Wilts	(14	,,)	29·71 ,,
Dorset	(10	,,)	33·53 ,,
Somerset	(16	,,)	35·54 ,,
Devon	(26	,,)	37·24 ,,
Cornwall	(13	,,)	42·48 ,,

The mean for the whole area being 34·08 in.

The mean annual rainfall at 12 stations (every county being represented by one or two) was as follows :—

1866–70	35·76 in.	1881–85	38·25 in.
1871–75	39·02 ,,	1886–90	33·07 ,,
1876–80	40·15 ,,	1891–95	34·84 ,,

(*To be continued.*)

WRAGGE'S AUSTRALASIAN WEATHER GUIDE.

To the Editor of the Meteorological Magazine.

SIR,—While thanking you for your very kind notice with reference to my "Almanac," I nevertheless regret that you should have done me an injustice by intimating that no reports have been issued from

this office except charts. I also much deplore your remarks *re* high level stations, and honestly tell you that I consider that you have not been by any means fair to my old friend Dr. Buchan. Our publications are issued monthly, and you will find them all in the rooms of the Royal Meteorological Society, the Royal Society, Burlington House, London, the Royal Geographical, and kindred Societies. Although I should be willing to supply you with our publications privately, I cannot do so, since our funds are limited, and I am not authorised to incur more than a certain amount of postage. Kindly publish this letter in the *Meteorological Magazine*.

Yours faithfully,

CLEMENT L. WRAGGE,

Brisbane, August 30th, 1898. Govt. Meteorologist for Queensland.

[We print the above as requested, though we doubt its utility, as there is not a word in it which contradicts anything stated on p. 87, as Mr. Wragge would have seen had he done us the honour of reading the review carefully. Dr. Buchan was not even mentioned, and certainly would not be, in these pages, without the respect due to his life-long work; but we have no wish to occupy space upon the subject, and therefore afford Mr. Wragge the above last word.—ED.]

LUNAR RAINBOW.

To the Editor of the Meteorological Magazine.

SIR,—The weather on Sunday evening, October 30th, 1898, was wild and squally in this district, and there was heavy rain between 6 and 6.40 p.m. The moon then came out in a clear opening between passing clouds, and on looking up I thought, from the stormy appearance of the sky, and the fact that a little rain still continued falling, that the conditions were favourable to the production of a lunar rainbow. I got on higher ground and scanned the western sky, where I immediately saw a bright, though incomplete bow. Only the right side of the arch was visible, and there was a faint supplementary fragment. The appearance reminded me forcibly of the curved train of a bright comet. After a duration of about five minutes, the phenomenon disappeared, the moon became hidden by clouds, and further showers of rain ensued.

About two miles west of my position, viz.: at Clifton Down, the rainbow appears to have been much better seen by Mr. A. H. Parkinson, who says that at 6.40 p.m. his attention was arrested by a small portion of a lunar rainbow, which in about three minutes had developed into a complete arch, and remained visible in that form for about three-quarters of a minute. The right side of it was the more conspicuous, displaying the prismatic colours, while the remainder was almost white. The secondary bow also appeared, but was exceedingly faint.—Yours sincerely,

W. F. DENNING, F.R.A.S.

Bishopston, Bristol, November 5th, 1898.

THE DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—Five months ago (p. 55) you were good enough to publish in your Magazine the rainfall for Worthing, showing the great deficiency which was manifest up to the end of April last. The decess is now much more marked, and the past twelvemonths form the driest period since observations were begun here in 1852.

There have been drier months in previous years—as in September, 1865, when only 0·10 in. of rain was registered.

There have been drier quarters—as in the second quarter of 1893, when only 0·95 in. of rain was recorded; but for the past 47 years there has never been so long a period during which dry weather has prevailed.

The mean rainfall for Worthing in the first nine months of the year is 18·47 in. In six of these years the fall has been less than 13·5 in., and in six other years the fall has been over 21 in. :—

Six Dry Years, Jan. 1st to Sept. 30th.	Fall in inches.	Six Wet Years, Jan. 1st to Sept. 30th.	Fall in inches.
1854	12·60	1852	21·83
1855	11·60	1856	22·10
1858	12·00	1860	25·90
1870	13·11	1877	21·30
1887	13·15	1879	29·55
1898	11·45	1894	25·01

Thus 1898 not only stands out prominently with the lowest fall, but it followed upon the dry autumn of 1897, so that the past twelvemonths show the fact more clearly when thus compared :—

Last 3 months of	Fall. in.	First 9 months of	Fall. in.	Total fall in 12 consecutive months. in.
1853 ...	9·30	1854 ...	12·60	21·90
1854 ...	7·50	1855 ...	11·60	19·10
1857 ...	7·60	1858 ...	12·00	19·60
1869 ...	7·38	1870 ...	13·11	20·49
1886 ...	11·89	1887 ...	13·15	25·04
1897 ...	5·58	1898 ...	11·45	17·03

This amount of 17·03 in. is 10·92 in. below the mean of 1852-96; and as there was also a decess from May 1st to September 30th last year, the actual loss in the past 17 months is equal to nearly 13 in. :—

		Fall. in.	Mean Fall. in.	Decess at end of each period. in.
1897.	May 1st to Sept. 30th	8·82	10·86	2·04
,,	Oct. 1st to Dec. 31st	5·58	9·48	5·94
1898.	Jan. 1st to March 31st.....	3·18	6·05	8·81
,,	April 1st to June 30th	5·90	5·28	8·19
,,	July 1st to Sept. 30th	2·36	7·14	12·97
	Total for 17 months	25·84	38·81	12·97

Yours faithfully,

Worthing, October 15th, 1898. C. KELLY, M.D.

P.S.—The fall in October was 4·26 in., or 0·37 in. above the average, but this still leaves a decess of 12·60 in.

THE EFFECT OF LIGHTNING ON AN OAK TREE.

To the Editor of the Meteorological Magazine.

SIR,—Mr. Wood's interesting letter of September 9th led me to seek for the oak in question, which he mentioned in your last number (p. 136) as having been struck by lightning during one of the August storms. Although I was unaware of the occurrence, in spite of the fact that I live in the immediate vicinity, I soon found it, and was surprised to find that though a fine tree, yet it was not the highest tree around, for there were others taller in close proximity; neither was it isolated in any way, for it was growing on the side of a ditch, with other trees. It stood therefore considerably lower than other solitary trees in the adjoining field. There is more than one solitary oak in that field larger than the one struck, and standing on higher ground, and therefore one would have thought more likely to attract the lightning. I mention these facts only for what they are worth, and as illustrating the apparently extraordinary capriciousness of the electric discharge in the objects on which it strikes.

Yours faithfully,

LLEWELLYN EVANS.

Cheltenham, November 10th, 1898.

[Possibly there was more water in the ditch near that tree than near the others.—ED.]

SOME HEAVY RAINS—OCTOBER 15TH–18TH, 1898.

[No returns quoted unless the aggregate for the four days reached 4·00 in., or the fall on some one day exceeded 2·00 inches.]

COUNTY.	STATION.	Fall on the 15th. in.	16th. in.	17th. in.	18th. in.	Total. in.
Devon	Druid House, Ashburton	1·19	1·62	1·36	·37	4·54
,,	Mamhead Rectory, Dawlish...	1·70	1·65	1·72	·48	5·55
,,	Polapit Tamar, Launceston...	·30	1·50	1·61	·92	4·33
,,	Oaklands, Okehampton	·44	·87	1·62	1·42	4·35
,,	Horwood, Bideford	—	—	2·25	—	—
,,	Athenæum, Barnstaple.....	·02	·58	2·13	1·46	4·19
Cornwall...	Lamellyn, Probus	·61	1·65	1·82	·14	4·22
,,	Green Bank, Liskeard	·23	1·16	2·85	·24	4·48
,,	Penleat, Altarnon.....	·27	1·61	2·44	1·42	5·74
Gloucester..	Wickwar Rectory	—	·60	1·22	2·21	—
Monmouth.	Shirenewton Hall, Chepstow	—	1·62	1·74	2·01	—
,,	Llanfrechfa.....	·11	1·73	1·10	1·52	4·46

N.B. — indicates no information, *not* no rain.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

OCTOBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
										Highest.		Lowest.			
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Highest Month.		Lowest Month.						Mean of all Highest	Mean of all Lowest.
						Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·906	30·189	29·576	9 a.m.	29·906	30·188	1897	29·597	1859	30·683	31st, 1891	28·640	16th, 1886	30·447	29·247
		1897	1859	9 p.m.	29·906	30·191	1897	29·554	1859	30·662	30th, 1891	28·774	31st, 1859	30·428	29·274
Shade Temp. Dry Bulb	49·2	54·4	44·6	9 a.m.	49·6	54·8	1861	44·7	1887	67·5	15th, 1862	29·6	28th, 1890	60·5	36·9
		1861	1887	9 p.m.	48·8	53·9	1861	44·0	1881	64·5	19th, 1864	30·9	27th, 1895	59·2	37·9
Shade Temp. Max.	57·5	..	...	...	...	64·4	1861	52·6	1881	80·9	4th, 1859	37·2	24th, 1859	68·1	47·3
Shade Temp. Min.	43·3	...	...	...	...	48·1	1861	38·9	1888	60·5	15th, 1862	23·8	28th, 1890	54·5	31·4
Shade Temp. Wet Bulb	47·4	53·0	42·3	9 a.m.	47·7	53·4	1861	42·4	1887	62·1	4th,'59; 15th,'62	28·6	28th, 1890	58·1	35·8
		1861	1887	9 p.m.	47·1	52·5	1861	42·1	1887	62·1	1st, 1861	30·5	26th, 1869	57·2	36·7
Solar Rad., black	81·3	...	...	...	...	89·1	1877	75·5	1875	116·9	4th, 1879	46·0	20th, 1880	107·4	53·7
Solar Rad., bright	62·3	...	...	...	...	67·0	1893	58·3	1880	86·8	1st, 1886	42·0	26th, 1895	76·5	49·1
Grass Minimum	39·0	...	..	...	...	44·3	1874	33·1	1888	58·3	3rd, 1862	16·8	28th, 1890	52·0	26·6
Soil, 1 foot	50·2	...	...	...	...	53·2	'76,'86	46·8	1888	59·8	2nd, 1895	41·0	30th, 31st, '95	55·3	45·0
Cloud	6·1	7·5	5·0	9 a.m.	6·4	8·5	1894	4·0	1893	10	Every year	0	Various	10·0	0·1
		'82, '94	1893	9 p.m.	5·8	7·4	1889	4·0	1892	10	Every year	0	Various	10·0	0·1
Rainfall	2·71	6·22	·56	9 a.m.	1·26	3·59	1880	·23	1884	1·09	31st, 1892	·00	Every year	·42	·00
		1865	1897	9 p.m.	1·45	3·33	1865	·07	1897	·91	12th, 1873	·00	Every year	·46	·00

Max. Rainfall in 24 hours, 1·35 in., 30th, 1894. Mean max. daily fall, ·66 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	75·2	23	34·6	13	61·1	45·4	44·0	74	118·1	30·8	2·27	21	7·1
Malta	83·1	26	52·8	3	73·5	58·2	55·1	71	144·7	45·4	·05	1	3·1
Cape of Good Hope	79·9	20	41·1	17	64·3	50·2	48·4	83	...	...	4·06	14	5·8
Mauritius	80·0	14	64·4	31	76·8	69·0	65·6	80	125·7	57·0	8·32	16	6·6
Calcutta	103·2	18	70·8	27	96·0	77·9	73·4	66	157·8	68·7	4·06	5	3·7
Bombay	94·9	28	79·4	12	91·1	81·5	76·2	73	145·5	72·8	·16	2	2·7
Ceylon, Colombo	90·6	13	72·0	3	88·0	78·4	75·3	81	154·0	69·5	5·80	22	6·1
Melbourne	69·4	30	35·0	26	60·0	43·7	44·1	75	131·0	30·2	2·09	10	6·3
Adelaide	70·4	29	37·9	25	62·0	46·3	44·3	73	132·4	29·2	3·80	13	4·2
Sydney	66·8	22	42·4	25	61·7	51·0	47·2	80	114·1	34·9	10·52	19	5·3
Wellington	71·0	9	36·5	27	58·6	47·7	46·7	79	105·0	26·0	5·96	17	5·0
Auckland	68·0	2	40·0	31	63·6	51·1	47·4	70	120·0	36·0	3·67	18	5·3
Jamaica, Kingston	89·1	5	69·2	7	86·0	72·4	71·3	75	...	...	9·66	8	...
Trinidad	95·0	11	63·0	10*a*	92·3	71·1	70·2	71	165·0	60·0	1·49	6	...
Grenada	87·6	30	71·2	10	84·4	75·2	70·1	69	148·0	...	·77	9	2·5
Toronto	74·0	31	37·4	6	64·3	46·4	46·6	72	97·5	28·0	2·31	7	5·4
New Brunswick, Fredericton	76·8	22	25·2	4	64·3	41·4	38·3	53	...	...	1·53	7	6·0
Manitoba, Winnipeg	82·7	24	25·8	5	68·4	37·9	...	...	...	...	·89	3	4·8
British Columbia, Esquimalt	82·5	25	30·5	6	63·1	44·3	44·8	76	...	...	·60	8	5·2

a—and 11.

REMARKS.

MALTA.—Mean temp. 64°·5, or 0°·5 above average. Mean hourly velocity of wind 11·0 miles, or 1·0 above average. Mean temp. of sea 67°·0. L on 9th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·2 below, of dew point 1°·3 above, and rainfall 3·88 in. above, their respective averages. Mean hourly velocity of wind 12·9 miles, or 2·6 above average; extremes, 27·8 on 3rd and 0·0 on 1st; prevailing direction E.S.E. and E. by S. T on 23rd; L and T on 24th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·7, or 0°·2 above, of dew point 0°·2 above, and rainfall 6·31 in. below, the averages. T88 on 6 days. H. O. BARNARD.

Adelaide.—Mean temp. 3°·4 below the average, and the lowest on record for May. Rainfall ·97 in. above the average. C. TODD, F.R.S.

Sydney.—Temp. 2°·0 below, rainfall 5·36 in. above, and humidity 4·9 above, their respective averages. Weather still dry in the S.W. districts.—H. C. RUSSELL, F.R.S.

Wellington.—Fine weather up to the 8th, then wet to the 15th, and showery from the 21st to the end of the month; altogether a wet month. T on 3 days; H on 3 days; foggy on 4 days. Earthquakes on 3rd, 8th, and 16th. R. B. GORE.

Auckland.—A showery month, rain being registered on 18 days, but the total more than ·50 in. below the average of 31 years. Mean temp. almost exactly the same as the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·16 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·86	XI.	Builth, Abergwesyn Vic.	8·77
II.	Dorking, Abinger Hall .	3·83	,,	Rhayader, Nantgwillt ...	8·55
,,	Birchington, Thor	1·74	,,	Lake Vyrnwy	5·79
,,	Hailsham	3·35	,,	Corwen, Rhug	5·24
,,	Ryde, Thornbrough	3·94	,,	Criccieth, Talarvor	5·77
,,	Emsworth, Redlands ...	3·75	,,	I. of Man, Douglas	4·58
,,	Alton, Ashdell	4·74	XII.	Stoneykirk, Ardwell Ho.	2·64
III.	Oxford, Magdalen Col..	4·33	,,	New Galloway, Glenlee	4·26
,,	Banbury, Bloxham	4·02	,,	Moniaive, Maxwelton Ho.	3·75
,,	Northampton, Sedgebrook	2·35	,,	Lilliesleaf, Riddell	4·09
,,	Stamford Duddington...	2·63	XIII.	N. Esk Res. [Penicuick]	5·15
,,	Alconbury	2·27	XIV.	Glasgow, Queen's Park..	3·97
,,	Wisbech, Bank House...	2·78	XV.	Inverary, Newtown	5·79
IV.	Southend	1·67	,,	Ballachulish, Ardsheal...	5·20
,,	Harlow, Sheering..... ...	4·32	,,	Islay, Gruinart School ...	2·44
,,	Colchester, Lexden	1·97	XVI.	Dollar.....	5·36
,,	Rendlesham Hall	1·39	,,	Balquhidder, Stronvar...	6·84
,,	Scole Rectory	1·81	,,	Coupar Angus Station...	5·21
,,	Swaffham	2·38	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	...	XVII.	Keith H.R.S.....	3·38
,,	Bishop's Cannings	4·73	,,	Forres H.R.S.	2·21
,,	Blandford, Whatcombe .	4·07	XVIII.	Fearn, Lower Pitkerrie..	2·97
,,	Ashburton, Holne Vic...	7·26	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	8·17	,,	Invergarry	4·08
,,	Hartland Abbey	6·11	,,	Aviemore H.R.S.	1·81
,,	Lynton, Glenthorne ...	9·40	,,	Loch Ness, Drumnadrochit	2·68
,,	Probus, Lamellyn	7·82	XIX.	Invershin	5·47
,,	Wellington, The Avenue	4·77	,,	Durness	3·51
,,	North Cadbury Rectory	4·02	,,	Watten H.R.S.....	2·77
VI.	Clifton, Pembroke Road	5·85	XX.	Dunmanway, Coolkelure	10·28
,,	Ross, The Graig	4·46	,,	Cork, Wellesley Terrace	7·37
,,	Wem, Clive Vicarage ...	4·20	,,	Killarney, Woodlawn ..	7·24
,,	Wolverhampton, Tettenhall	2·58	,,	Caher, Duneske	3·64
,,	Cheadle, The Heath Ho.	2·76	,,	Ballingarry, Hazelfort...	2·41
,,	Coventry, Priory Row ..	2·88	,,	Limerick, Kilcornan ...	4·91
VII.	Grantham, Stainby	2·96	,,	Broadford, Hurdlestown	2·61
,,	Horncastle, Bucknall ...	2·26	,,	Miltown Malbay	4·85
,,	Worksop, Hodsck Priory	2·40	XXI.	Gorey, Courtown House	4·06
VIII.	Neston, Hinderton	3·32	,,	Athlone, Twyford	2·59
,,	Southport, Hesketh Park	3·46	,,	Mullingar, Belvedere ...	2·85
,,	Chatburn, Middlewood.	3·93	,,	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	2·69	XXII.	Woodlawn	2·99
,,	Scarborough, Observat'y	3·87	,,	Crossmolina, Enniscoe ..	3·92
,,	Middleton, Mickleton ...	5·43	,,	Collooney, Markree Obs.	2·55
X.	Haltwhistle, Unthank...	6·72	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	2·80	XXIII.	Warrenpoint.....	4·94
,,	Duddon Valley, Ulpha School	6·39	,,	Seaforde.....	4·18
,,	Keswick, The Bank.....	5·69	,,	Belfast, Springfield	3·91
XI.	Llanfrechfa Grange	7·51	,,	Bushmills, Dundarave..	2·10
,,	Llandovery	5·85	,,	Stewartstown	4·43
,,	Castle Malgwyn	6·55	,,	Killybegs	4·08
,,	Brecknock, The Barracks	4·66	,,	Horn Head	4·60

OCTOBER, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth.	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·96	+ ·07	·84	29	13	71·1	3	40·2	2	0	0
II.		Tenterden ...	2·54	— 1·49	·84	29	17	66·0	3	39·0	11*a*	0	0
,,		Hartley Wintney ...	3·75	...	1·30	17	16	69·0	3	43·0	11	0	6
III.		Hitchin ...	2·46	— ·61	·53	29	18	68·0	3	33·0	8	0	...
,,		Winslow (Addington) ...	3·17	+ ·08	·48	16	16	68·0	2, 3	33·0	1	0	3
IV.		Bury St. Edmunds (Westley)	1·83	— 1·44	·40	29	18	63·0	4	40·0	11	0	...
,,		Norwich (Brundall) ...	2·48	...	·44	11	15	68·0	2	37·0	2	0	3
V.		Winterbourne Steepleton ...	4·93	...	·99	18	22	67·0	3	31·4	13	1	8
,,		Torquay (Cary Green)	5·88	...	1·31	16	18	68·9	21	42·2	2	0	0
,,		Polapit Tamar [Launceston]..	8·37	+ 3·44	1·61	17	25	66·0	2	32·0	12	1	2
VI.		Stroud (Upfield) ...	4·50	+ 1·47	1·82	18	16	65·0	3, 21	36·0	31	0	...
,,		ChurchStretton(Woolstaston)	6·09	+ 2·32	1·36	17	24	66·0	2	41·0	13*b*	0	...
,,		Worcester (Diglis Lock) ...	2·90	+ ·07	·72	18	22	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	...	...	...	..	...	...	...	...	...	...	...
,,		Boston ...	2·82	— ·29	·75	30	17	70·0	3	36·0	11	0	...
,,		Hesley Hall [Tickhill]...	2·45	— ·65	·49	16	19	68·0	3	32·0	14	1	...
VIII.		Manchester(PlymouthGrove)	3·62	+ ·25	·59	20	18	68·0	3	35·0	12	0	2
IX.		Wetherby (Ribston Hall) ...	5·08	+ 1·95	1·26	18	15	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	7·59	+ 1·56	1·41	30	17	...	...	...	...	...	...
,,		Hull (Pearson Park).	3·19	— ·46	·85	18	19	66·0	2, 3	33·0	11	0	2
X.		Newcastle (Town Moor) ...	4·86	+ 1·74	1·58	17	16	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	10·65	+ ·06	2·26	30	15	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	6·50	+ 1·96	1·10	7	22	...	...	...	...	...	...
,,		Haverfordwest	6·58	+ 1·43	1·48	28	23	67·6	2	34·3	12	0	3
,,		Aberystwith (Gogerddan) ...	5·43	+ ·08	·78	18	19	69·0	3	...	...	...	...
,,		Llandudno... ...	4·28	+ ·89	·83	28	19	67·0	3	41·0	13	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	4·48	+ 1·22	·84	17	13	75·0	4	36·0	13	0	...
XIII.		Edinburgh (Blacket Place)...	3·70	...	1·10	17	14	70·2	4	40·0	24	0	...
XIV.		Colmonell	2·34	...	·47	30	13	77·0	4	32·0	11	1	...
XV.		Tighnabruaich ...	5·26	...	1·04	25	18	62·0	5	35·0	17*c*	0	...
,,		Mull (Quinish)...	3·93	— 1·36	·75	31	16	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	5·70	+ 2·74	2·50	18	14	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·00	+ 2·76	2·50	17	21	70·1	2	36·7	12	0	...
XVII.		Braemar	6·43	+ 2·82	1·52	17	20	73·8	3	29·2	11	2	12
,,		Aberdeen (Cranford)	3·67	...	·76	18	18	75·0	2, 4	32·0	31	1	...
,,		Cawdor (Budgate) ...	2·04	— ·69	·92	30	19	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	3·75	— ·90	·70	31	10	...	...	...	...	...	...
,,		Glencarron Lodge...	7·41	...	1·17	17	18	74·5	5	32·6	29	0	...
XIX.		Dunrobin ...	...	...	...	...	...	...	...	...	...	...	...
,,		S. Ronaldshay (Roeberry) ...	3·86	+ ·13	1·06	19	19	65·0	3, 4	38·0	18*d*	0	...
XX.	IRELAND.	Darrynane Abbey...	6·03	...	·89	13	25	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	6·06	+ 2·24	1·29	13	21	70·0	2	32·0	12	1	...
,,		O'Briensbridge (Ross) ...	2·36	...	·55	8	18	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	3·36	+ ·07	·80	8	22	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·58	+ ·20	·81	17	19	64·8	3	40·0	12	0	0
XXII.		Ballinasloe	2·87	— ·12	·53	8	21	66·0	10	32·0	12	1	...
,,		Clifden (Kylemore)	6·13	...	1·07	13	25	...	...	...	...	...	...
XXIII		Waringstown ...	2·79	+ ·08	1·32	17	17	72·0	4, 5	35·0	10*e*	0	4
,,		Londonderry (Creggan Res.).	3·42	— ·25	1·23	17	22	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	3·80	+ ·70	1·30	17	20	68·0	4	34·0	10*f*	0	4

+ Shows that the fall was above the average ; — that it was below it.

a—and 13. *b*—and 14. *c*—and 18. *d*—and 19. *e*—and 11, 12, 13. *f*—and 11, 19, 27.

METEOROLOGICAL NOTES ON OCTOBER, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Another warm month; mean max. temp. 59°·6, or 1°·4 higher than in 1897 and 1893; mean min. 48°·7, or 3°·0 above that of last year. There were 14 days with max. temp. above 60°, and like 1897 none under 50°. Duration of sunshine 102 hours 25 mins. The rainfall from 16th to 20th greatly helped the grass and filled up cisterns, but not the ponds or springs, and even the heavy rain of the 29th had no effect on a well, which having fallen 7 inches each month since July, is now down to the same level as before the March snow. Fog on 10th, 11th, 13th, 15th, and 21st. L and distant T on 29th.

HARTLEY WINTNEY.—The great drought which continued through August and September did not terminate until the 9th, after which R fell almost daily; the amount on 17th being the heaviest fall since July 29th, 1894. Total R ·32 in. above the average. Cold E. winds prevailed at the beginning of the month, but the latter half was exceedingly mild. L on 11th, S.S.W. gale on 30th; fog on 10th and 21st; ozone on 10 days. Swallows left on 10th.

WINSLOW, ADDINGTON.—During the month much needed R fell, doing a great deal of good. The weather was mild throughout, and some days were warm and summerlike. The max. temp. rose to, or above, 60° on 14 days.

BURY ST. EDMUNDS, WESTLEY.—Mild and warm, with R in small quantities on 18 days. The want of water continued, many deep chalk wells being nearly dry. Distant T on 29th.

NORWICH, BRUNDALL.—Very mild, the mean temp. being about 5° above the average, while the max. reached, or exceeded, 60° on 17 days. Apparently the mildest October since 1876. Fog, T and L on 11th; L on 17th; sharp TS at 11.30 p.m. on 29th.

WINTERBOURNE STEEPLETON.—The main features of the month were, the break up of the long drought, and the high temperature. Nearly 5 inches of R fell, whereas the average of the previous 9 months is only about 1·75 in. The total for the year is still very deficient, being only 20·34 in., while for the previous 5 years the mean is 28·26 in. In consequence the springs are lower than they have been for many years. The mean temp. was 53°·1, or 5°·0 above the average of five Octobers, while the mean min. is 6°·0 above average. Fog on 7th and 10th.

TORQUAY, CARY GREEN.—Rainfall for the month 1·73 in. above, and for the first 10 months of the year 7·14 in. below, the average. Mean temp. 56°·7, or 5°·5 above the average. Duration of sunshine 89 hours 40 mins., or 24 hours 45 mins. below the average. Eight sunless days.

POLAPIT TAMAR.—Exceptionally wet throughout, and the heaviest total R for any month in 18 years. General absence of stormy or frosty weather. Fog on 5 days.

WOOLSTASTON.—Very wet, with no frost. Mean temp. 51°·3.

MANCHESTER, PLYMOUTH GROVE.—For the first ten days fine autumn weather prevailed; dense fog occurred on 12th, and the last fortnight was unsettled and mostly wet and stormy. Mean temp. 52°·8.

ARNCLIFFE VICARAGE.—Unusually mild, with no frost. Dahlias in bloom on 31st.

WALES.

HAVERFORDWEST.—The fine weather of September continued to October 12th; on 13th a wet, stormy period set in, and continued to the end of the month. Very heavy R fell on 28th and 29th, 2·18 in. Great absence of sunshine from 13th to 31st. The month was generally mild, and there was abundance of grass.

ABERYSTWITH, GOGERDDAN.—The last fortnight was very wet, sunless and close.

SCOTLAND.

CARGEN [DUMFRIES].—The month was remarkable for exceptionally high mean temp., 51°·4, which is 2°·4 higher than the average for May, and has only once been exceeded in October in 39 years. From the 1st to 16th R fell on only one day; while out of the remaining 15 days, 12 were wet. The duration of sunshine was slightly below the average. The absolute absence of frost during the autumn had an extraordinary effect on vegetation, blossom appearing on pear trees, rhododendrons, &c., while dahlias and begonias are still in full bloom. The R of the first 10 months of the year exceeds the average by 1·08 in.

EDINBURGH, BLACKET PLACE.—Very mild. The mean of the day temp. is 2°·5 above, and of the night temp. 5°·1 above, the average. The mean temp., 51°·0, is the highest in October since 1857, and has been surpassed in only 6 years since 1764. Sunshine below the average, and rainfall 54 per cent. above the average. Dense fog on 5th and 29th. The max. temp., 70°·2, on 4th, is the highest in October since 1845.

COLMONELL.—Rainfall 2·49 in. below the average of 22 years. Mean temp. 52°·2, or 6°·2 above the average of 22 years, and the highest in that period.

TIGHNABRUAICH.—The first half of the month was anticyclonic, the latter half cyclonic, with heavy rainfall. A severe N.E. gale did much damage in the middle of the month.

ABERDEEN, CRANFORD.—A severe gale from 15th to 20th caused many shipwrecks on the N.E. coast.

S. RONALDSHAY, ROEBERRY.—The first half of the month was very fine, the last half wet and stormy. Mean temp. 49°·5, or 3°·2 above the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; leaves still on the trees at the end.

WATERFORD, BROOK LODGE.—The wettest October since 1875. Weather very broken all through, and a good deal of fog in the early part. Mean temp. 52°·9.

O'BRIENSBRIDGE, ROSS.—Very cold and stormy from the 13th to the end.

DUBLIN, FITZWILLIAM SQUARE.—Singularly mild. The first 12 days were generally fine and dry; but from the 13th R fell on 18 consecutive days. Mean temp. 52°·8, or 3°·1 above the average. High winds on 10 days, reaching the force of a gale on 15th and 16th. Fog on 8 days. Lunar halo on 26th. L on 11th.

OMAGH, EDENFEL.—The remarkable mildness of the autumn was maintained, practically without interruption, throughout. Neither the max. temp., nor the mean (50°·0) have been reached before in October, since records began in 1864. Mean temp. 4°·1 above the average. Dahlias and begonias were unscathed on November 6th, and although the autumn tints were magnificent, many trees were comparatively green at the close. Swallows did not leave until the 6th.

[CV.]
II.

[PRICE FOURPENCE.
Or 4s. per annum post free.

THE NEW YORK PUBLIC LIBRARY

SYMONS'S MONTHLY TEOROLOGICAL MAGAZINE.

CONTENTS

PAGE
Fitzroy ... 161
ish Association at Bristol, 1898 ... 164
:—
gris National d'Hygiène et de Climatologie medicale de la Belgique et du Congo ... 167
Belgique et du Congo ... 168
tions of the Royal Alfred Observatory, Mauritius ... 169
ought and the Colours of Flowers ... 169
Meteorological Society ... 170
Rainfall ... 170
ll in Nicaragua ... 171
ts of Meteorological Observations at Camden Square during November for 40 years, 1858–97 ... 172
tological Table for the British Empire, June, 1898 ... 173
lementary Table of Rainfall, November, 1898 ... 174
fall and Temperature in November, 1898, at 50 Stations ... 175
eorological Notes on November, 1898

DECEMBER, 1898.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 5s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCV.] DECEMBER, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

ADMIRAL FITZROY.

THE GENESIS OF METEOROLOGY.

[THE following long and anonymous article, which appeared under the above headings in the *Dundee Advertiser* of October 31st, contains so many items of general interest that we have decided upon reprinting it, without, however, assuming responsibility for all the statements. Occasionally the writer has been misled, and where we have noticed this we have put a correction as a foot note. But we do not presume to imply that we have verified every statement, quite the contrary, and in the interest of truth we hope that any of our readers who notice other errors will mention them.—ED.

The science of modern meteorology may be said to have been founded by Admiral Robert FitzRoy (1). He was the son of General Lord Charles FitzRoy, second son of the third Duke of Grafton, and was born in June 1805. He entered the Navy in 1819, and became Lieutenant on board the "Adventure" in 1824. Through the death of Commander Stokes in 1828 he was promoted to the command of the "Beagle," and during the three succeeding years he completed the survey of the coasts of Patagonia and Terra del Fuego. He also commanded the "Beagle" during her famous voyage round the world in 1831-36, with Charles Darwin as naturalist; and it was during this voyage that Darwin conceived his idea of the origin of species. On FitzRoy's return he, in conjunction with Captain King, published in 1839 his *Narrative of the Surveying Voyages of the* "Adventure" *and the* "Beagle," in which he displayed considerable ability as an observer of Nature, though Darwin's *Journal of a Voyage round the World* necessarily became the classic record of this wonderful expedition. In 1841 FitzRoy was elected M.P. for Durham, and held that seat till 1843, when he was appointed Governor of New Zealand. For two years he kept this important

(1) Too sweeping an assertion.

position, but his endeavours to conserve the rights of the Maoris against the European settlers made him very unpopular, and in 1845 he resigned the Governorship and returned to England, having been practically recalled by the Government out of deference to the clamour of the Colonists. In 1846 he published his *Remarks on New Zealand*, in which he indicated the best policy for developing that important Colony. He resigned active service in 1850, and shortly afterwards was advanced to the rank of Vice-Admiral. His principal work was accomplished after 1854. In that year he was appointed meteorological statist to the Board of Trade, and in that office he carried out systematical investigations in meteorology, and devised the system of storm-signals which is still worked with great advantage to navigators. At first his storm-code was ridiculed as the revival of an effete fad among weather-prophets, but it was soon found that prophecy as to weather which was founded on accurate data such as his meteorological reports afforded was not to be despised. The system was speedily adopted, not only in this country but also on the Continent. The FitzRoy barometer, by which approaching storms may be foretold, is regarded as one of the triumphs of the nineteenth century (2). Admiral FitzRoy prosecuted his barometric studies with great energy. In 1863 he published his *Weather Book*, a work which contained the results of observation spread over many years. The labour entailed in the production of this work was so great that his mind gave way, and on 30th April, 1865, he committed suicide during a fit of mental depression (3). The storm-glass, or FitzRoy barometer, devised by him, will always be associated with his name. But though it was unquestionably invented by him without the least suspicion that it had been anticipated, it is not the less a fact that a similar weather-glass with camphor was constructed in London a century before FitzRoy's was designed (4). In 1649 Périer, the brother-in-law of Blaise Pascal (1623-1662), while engaged making experiments with Pascal to determine the weight of the atmosphere, enunciated the theory of "meteorological correspondences" by which storms could be foretold, which was identical with that of FitzRoy.

Ancient Weather Prophets.—Observations for the purpose of forecasting the weather are probably as old as the history of man, and traditional maxims on this subject exist in all savage nations. The

[2] No. The barometers called "FitzRoy barometers" were, we think, only brought out after his death; certainly he would have been horrified at the tiny tubes with which some of them are furnished.

[3] No. It was not the compilation of the *Weather Book*, but general worry, and the absence of fresh air and exercise which produced the catastrophe.

[4] The "storm-glass" and the "FitzRoy barometer" are two totally different things, and FitzRoy devised neither. He knew of the "storm-glass" and bestowed on it far too much time, but he never claimed to have devised it; on the contrary, he says in the *Weather Book*, "Considerably more than a century ago, what were called 'storm-glasses' were made in this country. Who was the inventor is now very uncertain; but they were sold *on Old London Bridge* at the sign of the *Looking Glass*."

Egyptians and the Hindus were acquainted with the periodicity of wind-storms at a very remote time, and allusions to what we now call the "trade-winds" are to be found in ancient Sanscrit writings and in Egyptian hieroglyphs. From Egypt the knowledge of meteorology was carried to Greece, and Democritus (460 B.C.—360 B.C.) was well acquainted with the theory of the winds held by the Eastern nations. Archimedes (287 B.C.—212 B.C.) was renowned as a weather-prophet able to foretell storms by the appearance of the sun, and by studying the phases of the moon. The study of atmospheric currents was so general at the beginning of the Christian era that Pliny (23 A.D.—79 A.D.) refers to the works of more than twenty authors devoted to this subject. The surest proof, however, of the skill of early agriculturists in forecasting the weather is afforded by Virgil (70 B.C.—19 B.C.). His *Georgics* is full of weather-wisdom, strikingly similar to that of the time before FitzRoy had made meteorology a definite science, and had systematised observations over a wide area. The following passage is only one of many in the *Georgics* bearing on this subject:—

> If to the swift-speeding Sun, and moons
> That follow in their cycle, thou shalt look,
> Ne'er thee to-morrow's hour shall lead astray,
> Nor by the crafts of cloudless night shalt thou
> Be tricked. What time the Moon first gathers in
> Returning fires, if she shall have embraced
> The sable ether with a darkling horn,
> Immense for tillers, and the deep, will rain
> Be brewing. But if she a maiden red
> Have o'er her visage poured, there will be wind.
> But if at her fourth rise—for that will prove
> The most unerring counsellor—undimmed,
> Nor with blunt horns, through heaven shall she career,
> Both all that day, and those which shall arise
> Therefrom to the completion of the month
> From rain and tempests will be free.

The last portion of the quotation is very remarkable. It is a distinct anticipation of the famous meteorological law discovered and announced by Marshal Bugeaud (1784—1849) in November 1841, and afterwards confirmed by M. de Conninx, to the effect that if the moon be clear and with upturned horns on the fourth day, the rest of the month will be free from wind and rain ([5]). According to Dr. J. W. Draper (1811—1882), author of that remarkable work, *The Intellectual Development of Europe*, the Arabs in the eleventh century were deep students of atmospheric phenomena. Alhazen (died 1038) knew that the pressure of the atmosphere lessened according to the height of the observer above the sea level; and estimated the difference of weight of a body in a condensed and in a rarefied atmosphere. He understood the Greek theory as to wind-currents, and dimly outlined the modern method of weather-forecasting by comparing the incidence of storms in different areas. The foretelling of stormy weather in

[5] But had not Virgil adopted the idea from Aratus?—See *Met. Mag.*, vol. ii. (1867), p. 92.

connection with meteoric showers was described by Virgil, and indicated by Milton in *Paradise Lost*, centuries before it was scientifically explained by M. Coulvier-Gravier (6). From the Middle Ages the 10th of August has been regarded with special attention, as it has been noticed that meteor-showers on that day prelude a period of stormy weather. In the same way brilliant aurora-borealis displays frequently foretell storms, possibly because they show electrical disturbances in the atmosphere, which always accompany severe tornadoes. Sir Humphrey Davy's theory that the aurora is simply a manifestation of free electricity in a rarefied atmosphere is sufficient to explain the storms which usually follow exceptional displays of "the borealis race." (7) It will be seen from this outline of weather-wisdom that the prophet who forecasts storm or sunshine is not a modern innovation, though he has reduced his methods to a scientific basis.

THE BRITISH ASSOCIATION AT BRISTOL, 1898.

(*Concluded from p. 151.*)

The Classification of Polydiurnal Weather Types in relation to the Prolongation of the Daily Forecast in Western Europe.

By DOUGLAS ARCHIBALD, *M.A., F.R.Met.Soc.*

The results of modern meteorological investigation, whether official or amateur, statistical or synoptic, have shown the existence of specific types of weather embracing wide areas and intervals of time varying from several days to months, and seasons which tend to produce persistence or recurrence of the more ephemeral changes connected with the passage of the smaller, temporary, and movable cyclonic and anticyclonic systems.

These large weather types may be roughly classified as :—(1) Seasonal or x monthly, and (2) y daily.

The former appear, both in their normal and abnormal forms, most clearly in tropical countries, such as India, where the y daily changes are small and where the Summer season is always characterised by the formation of a permanent cyclonic area over Persia and North-West India, with subsidiary low pressure troughs over the Ganges basin, round which the so-called S.W. monsoon circulates with a complete reversal of pressure conditions at the opposite season.

These conditions in their normal form are evidently the result of seasonal actions due to the direct influence of the sun on the Asiatic continent and Indian Ocean, and stated thus, may be predicted to recur and form a large proportion of the seasonal forecast every year.

When, however, we descend from the general to the particular we find each year's S.W. and N.E. monsoon differ from that of every other year.

6 But does anybody now believe in it?

7 But where is proof to be found that they "usually follow"?

Superposed on the regular normal x monthly type is what may be termed the yearly seasonal abnormal type, or z annual variation of the x monthly type, corresponding to which both the intensity and shape of the seasonal cyclone and anticyclone and the accompanying weather vary. Such type, however, once initiated at the critical commencing month of the season, is found to persist more or less all through. This is the practical basis of the seasonal or x monthly weather forecast of the Indian Service, so ably worked by Mr. Eliot, F.R.S., at Simla.

In Europe the seasonal type, though still manifest, is not large enough in comparison with the y daily changes to enter in at present as a specific factor in the forecast.

On the other hand, the restriction of the forecast to 24 or 36 hours is unnecessarily arbitrary in view of the study of y daily types foreshadowed by the late Honourable Ralph Abercromby and laboriously carried out by Professor Köppen and Professor J. Van Bebber in their recent discussion of "Die isobaren Typen des nordatlantischen Ozeans und West-Europas." [Hamburg, 1895.]

Abercromby, in his "Principles of Forecasting by means of Weather Charts," published by the Meteorological Council, classifies weather types under four heads—northerly, southerly, easterly, and westerly.

Professors Köppen and Van Bebber recognise twenty specific types of y daily weather.

A comparison of these with Abercromby's shows them to be all included in one or other of his four primary headings, of which they form specific sub-types.

The investigation further shows that :

(1) They admit of being more scientifically classified under the heads O oceanic, K continental, L littoral, P peripheral, N northerly, and S southerly. Sub-variations are denoted by suffixes, thus : O_s, O_k, O_l, O_n, &c.

(2) Certain groups occur preferably at each season, *i.e.*, the seasonal type or tendency partly controls the formation of the y daily types.

(3) The intensity and paths of travelling high and low pressure systems vary with each type and season.

(4) Their effect in raising or lowering temperature and otherwise materially altering the weather is specifically shown by comparisons at such places as Hamburg and Munich.

(5) Their average duration is found to be about four days, and this figure is remarkably constant on the average for all the twenty species.

(6) There appears to be a fairly definite tendency on the part of certain types to succeed other types or to recur, such recurrence in some cases approximating to the seasonal permanence exhibited in the tropics.

In fine, a science of weather types is growing up by which even now the weather may, with due regard to a sudden change of type, be provisionally forecasted in general terms, and particularly for agricultural purposes, for *half a week* or *more*.

The present daily forecast in England is admirable for the purpose for which it was primarily instituted, viz., storm warning.

For agricultural purposes it is too short, while its assumption of precision in the matter of rainfall for each sub-division is not always warranted by the results. The author, therefore, suggests that in view of the hopefulness of the field unlocked by Professors Köppen and Van Bebber, steps be taken to compare the past weather maps of the British office with the types they have determined, and that a supplemental forecast be presently attached to the daily forecast, giving a more general forecast of conditions likely to continue for three or four days, based on the ascertained presence of a certain type over Western Europe and as far over the Atlantic as can be determined through the aid of arriving ship's logs.

It would further be of primary importance in carrying out such extension of the forecast on the basis of the study of the position and movement of the barometric action-centres, to be able to have telegraphic communication with places situated near the normal position of the centres of such action-centres. Iceland, the Azores, West Russia, and Eastern Germany and Austria would appear to be the most important for such purposes.

The Great Assam Earthquake of June 12th, 1897, by R. D. OLDHAM.

The author said that this earthquake was the largest and, with a few possible exceptions, the most violent of which there was any record. The area over which the shock was sensible was not less than 1,750,000 square miles, while the focus occupied an area of 200 miles in length and 50 miles in width. If it had happened in England not a house would have been left standing between Manchester and London. Landslips on an unprecedented scale were produced in the Garo and Khasia hills and in the Himalayas north of Lower Assam. A number of lakes had been produced by changes of level due to the earth movements by which the earthquake was caused, and the mountain peaks had been moved both vertically and horizontally. Monuments of solid stone, and forest trees had been broken across by the violence of the shaking they had received. Communications of all kinds were interrupted; bridges were overthrown, displaced, and in some cases thrust bodily upwards to a height of as much as 20 ft., while the rails on the railways were twisted and bent. Earth fissures were formed over an area larger than the United Kingdom, and sand rents, from which sand and water were forced in streams to a height of 3 ft. to 5 ft. above the ground, were opened in incalculable numbers. The loss of life was

comparatively small, owing to the time of day at which the earthquake occurred—5 o'clock in the afternoon—and the damage done was reduced by the fact that there were no large cities within the area of *maximum* violence; but in extent and capacity of destruction, as distinguished from destruction actually accomplished, this earthquake surpassed any of which there was historical record, not even excepting the great earthquake of Lisbon of 1755. At the conclusion of the paper, which was copiously illustrated, he mentioned that the Government of Assam, the whole of whose offices were destroyed, were able to announce within five days that everything was in full swing again; and as to the railways, on which (for a length reaching as far as from Bristol to London and on to Dover) traffic was at first entirely suspended, in three weeks trains were running to their original timing.

REVIEW.

Congrès National d'Hygiène et de Climatologie médicale de la Belgique et du Congo. Seconde Partie. Congo (climat, constitution du sol et hygiène de l'état indépendant). Hayez, Bruxelles. 1898. Roy. 8vo. 646 pages, map, diagrams, and plates.

We do not remember having seen Part I., but the above, Part II., is very welcome.

To those who recollect the maps of Africa issued even within the last fifty years, this bulky volume is very startling. Here is a nearly complete record of meteorological observations at sixty-five stations with names unknown, to $\frac{99}{100}$ths of the population of the world, and for the very area marked upon the maps of our youth as "Unexplored," we now have a map with all the rivers, villages, and towns duly named, and in the text, details of the climate, geology, food supplies, drainage, population, occupations, &c.

It is impossible to review such a book, it must have taken months to compile; how can a reviewer verify all the facts in a few days?

All that we can do is to indicate roughly the contents, and to record our opinion that *quâ* the portion of Africa between 4° N. and 12° S., and from the Atlantic to 30° E., it is indispensable to all who want to understand the country, whether from a physical or a commercial standpoint.

The book is based upon the replies to a series of questions sent by a committee of the *Soc. Roy. de Médicine publique de Belgique* to the principal Europeans residing in (or near) the Congo State. First come essays, meteorology by MM. Lancaster and Meuleman; geology by M. Cornet; diseases and statistics; and hygiene by MM. Bourguignon, Dreypondt, and Firket; and after these come reports upon the individual stations arranged alphabetically.

The importance of the article upon climate will be realised when it is remembered by whom it was written, and that it occupies nearly 150 pages besides numerous diagrams. All interested in Tropical climate must read it.

PUBLICATIONS OF THE ROYAL ALFRED OBSERVATORY, MAURITIUS.

In accordance with the notice on p. 89 of the present volume, applications were received from the following institutions and persons, and their requests have been complied with as far as possible. Nearly a hundred-weight has been sent off to the undernoted, in the order of their application :—

New Hampshire State Library, Concord, U.S.A.
Roy.Meteor.Soc., London.
J. Baxendell, Esq., F.R.A.S., Observatory, Southport.
Kew Committee, Kew Observatory, Richmond, Surrey.
A. L. Rotch, Esq., Blue Hill Observatory, Mass., U.S.A.
Prof. Stupart, Meteorological Office, Toronto.
C. Stewart, Esq., Meteorological Commission, Cape Town.
A. J. Hale, Esq., Barrington Road, Crouch End, N.
Librarian, Johns Hopkins University, Baltimore, U.S.A.
Dr. L. Swift, Lowe Observatory, Echo Mountain, California.
Prof. Dr. Hellmann, Margarethenstrasse, Berlin.
Kansas University, Kansas, U.S.A.
Librarian, Linen Hall Library, Donegal Square, Belfast.
Hofrath Dr. J. Hann, Graz, Austria.
I. F. H. Carr Gregg, Esq., Birchwood, Burgess Hill, Sussex.
E. W. Ellerbeck, Esq., F.R.A.S., Observatory, Scarborough.
F. Campbell Bayard, Esq., LL.M., Pres. R.Met.Soc., Wallington.

There are still many copies for some years, and one or more for each year mentioned below. As will be seen, no consecutive sets can be supplied, but anyone interested in the subject has only to write for whatever he or she wishes, and to pay carriage if the latter exceeds a few pence.

REPORTS.

1878, 1879, 1881, 1882, 1883, 1884, 1885, 1887, 1888, 1889, 1890, 1891, 1894.

RESULTS.

1872, 1877, 1878, 1879, 1880, 1881, 1882, 1884, 1885, 1889, 1890, 1891, 1892, 1893, 1894, 1895.

I cannot undertake to store these reports indefinitely ; nearly six months' notice has been given, and I shall part with all not applied for early next year.

Copies of the Report for 1877 *and of the Results for* 1861, 1863, 1864 *and* 1865 *are much needed.*

THE METEOROLOGICAL SOCIETY OF THE MAURITIUS.

Nothing has yet been settled respecting the back issues of this Society, which are much wanted in Europe. I am quite ready to assist, but it rests with the authorities in Mauritius.

62, *Camden Square, N.W.* G. J. SYMONS.

THE DROUGHT AND THE COLOURS OF FLOWERS.

THE REV. W. WILKS made the following observations on the colouration of flowers of the present season. Similar changes were recorded in *Nature* last year by Mr. Hughes-Gibbs of Tarrant Gunville, Dorset:—"All through the exceptionally hot weather of the end of July and August, all scarlet flowers had a tinge of dull brown in them, pink had a shade of orange, yellow was very yellow, white was creamy. This was very marked—*e.g.*, in Dahlias. Thus, Fire King and Sunset, ordinarily two bright clear scarlet flowers, had a distinct dull brown tint overlying and spoiling utterly the usual scarlet, so much so, that having been away from home the first three weeks of the heat, I thought on my return that the Dahlias must have somehow got wrongly named. But now that the weather is cooler, the bright scarlet has come back, and the dull browny tint has gone, and all is as usual. The only shades of colour the heat seemed (to me) to suit, were the salmons, and they have been very fine and intense, having a sort of glow added to them."

Journal of Horticulture.

ROYAL METEOROLOGICAL SOCIETY.

THE opening Meeting of the Session was held on Wednesday evening, November 16th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

A Report on experiments upon the exposure of anemometers at different elevations, was presented by the Wind Force Committee. The experiments have been carried out by Mr. W. H. Dines and Capt. Wilson-Barker, on board H.M.S. "Worcester," off Greenhithe. Five pressure-tube anemometers were employed, the first being at the mizzen royal masthead; the second and third at the ends of the mizzen topsail yardarm; and the fourth and fifth on iron standards 15 feet above the bulwarks. The results show that the ship itself affected the indications of the lower anemometers, while some low hills and trees, which are a quarter of a mile away from the ship, to the south and south-west, also affected the wind velocity from those quarters. The Committee are of opinion that the general facts deducible from these observations bearing on the situation of instruments for testing wind force are: (1.) That anemometers must have a fairly clear exposure, and for a mile at least all round, there should be no hills, or anything higher than the position of the instruments. (2.) That on a ship the instrument should be 50 feet above the hull, but on land it will generally be necessary to carry the instrument somewhat higher, to be determined entirely by the local conditions. (3.) That no other form of anemometer offers such advantages as the pressure-tube, from the fact that it can be run up and secured easily

at this height above a building, and that the pipes and stays can be so slight as to offer no resistance to the wind, or cause any deflecting currents.

Capt. D. Wilson-Barker read a Paper giving the results of some observations which he had made on board ship with several patterns of hand anemometer with the view of comparing the estimated wind force with that indicated by the different instruments.

Mr. W. Marriott exhibited some lantern slides, showing the damage caused by the tornado which burst over Camberwell about 9.30 p.m. on October 29th. The damage was confined to an area of about half a square mile, and within that space, chimney-stacks were blown down, houses unroofed, trees uprooted, and windows broken.

BRITISH RAINFALL.

GREATLY to my regret, I have recently found that three observers have continued to use gauges, rusty, worn out, and quite unworthy of them.

I do not think that any reader of this Magazine would allow his instruments to become dilapidated, but one cannot tell, and there can be no harm in mentioning the fact, and in pointing out that every observer who neglects his instruments, or is careless in reading and entering the results, is not merely useless, but depreciates the value of the whole organisation.

A new and verified gauge can now be delivered to anyone in the British Isles for 16s. 6d., therefore there can be few cases where the cost of a new gauge can compel the use of a dilapidated one. I earnestly call attention to the matter before the arrival of the new year, and also to Rules I. to IV., and XVI.

G. J. S.

RAINFALL IN NICARAGUA.

THE total rainfall at Rivas, near the Pacific coast of Nicaragua, was 123·43 in. in 1897. Rivas is about four miles to the west of Lake Nicaragua, and nearly on the line of the proposed Nicaragua Canal. Previous records ranged from 30 in. to 90 in. for the year. On the Atlantic side of Nicaragua, at Greytown, the total rainfall in 1890 was 320·48 in. with 274·85 in. in the Deseado Valley, twelve miles inland.

[Schott gives the mean fall at Aspinwall (Lat. 9° 23′ N., Lon. 79° 53′ W.) for 6 years as 121·60 in.—ED.]

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

NOVEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
						Highest Month.		Lowest Month.		Highest.		Lowest.		Mean of all Highest	Mean of all Lowest.
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·929	30·307	29·678	9 a.m.	29·931	30·313	1867	29·700	1872	30·741	21st, 1897	28·533	11th, 1891	30·484	29·156
		1867	'72, '77	9 p.m.	29·927	30·301	1867	29·653	1877	30·711	21st, 1897	28·760	18th, 1880	30·485	29·202
Shade Temp. Dry Bulb	42·8	48·9	36·9	9 a.m.	42·7	49·1	1881	36·9	1871	61·2	1st, 1867	23·8	23rd, 1858	54·8	31·2
		1881	1871	9 p.m.	42·9	48·8	1881	36·8	1871	59·7	7th, 1895	22·0	28th, 1890	54·3	32·3
Shade Temp. Max.	48·7	..	...	...	...	54·2	1881	43·6	1871	63·9	1st, 1894	28·6	28th, 1890	58·4	38·1
Shade Temp. Min.	37·7	...	...	...	...	43·3	'81, '88	32·8	1871	54·7	2nd, 1894	20·1	24th, 1858	49·6	27·2
Shade Temp. Wet Bulb	41·4	47·2	35·4	9 a.m.	41·3	47·2	1881	35·4	1871	60·2	1st, 1867	23·7	23rd, 1858	53·0	30·3
		1881	1871	9 p.m.	41·4	47·1	1881	35·4	1871	57·5	15th, 1895	20·9	28th, 1890	52·4	31·2
Solar Rad., black	63·6	...	...	...	...	70·5	1877	57·7	1885	98·1	1st, 1894	31·4	16th, 1887	88·0	41·9
Solar Rad., bright	52·0	...	...	...	...	57·5	1881	47·1	1878	73·8	1st, 1894	29·1	28th, 1890	64·4	39·1
Grass Minimum	33·7	...	..	...	...	39·1	1888	29·2	1896	52·7	7th, 1877	15·9	19th, 1861	46·9	22·8
Soil, 1 foot	44·4	...	...	...	...	46·8	1881	41·2	1896	52·6	1st, 1886	36·6	30th, 1879	48·7	39·8
Cloud	6·6	7·8	5·4	9 a.m.	6·7	8·7	'92, '97	4·9	1859	10	Every year	0	Various	10·0	0·5
		'92, '97	1865	9 p.m.	6·4	7·7	1875	5·2	1877	10	Every year	0	Various	10·0	0·1
Rainfall	2·30	4·65	·53	9 a.m.	1·19	2·45	1888	·21	1871	·80	29th, 1874	·00	Every year	·39	·00
		1861	1858	9 p.m.	1·11	2·91	1861	·33	1862	·98	13th, 1861	·00	Every year	·36	·00

Max. Rainfall in 24 hours, 1·42 in., 13th, 1861. Mean max. daily fall, ·58 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1898.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	77·4	18	40·1	1	68·2	50·4	48·7	71	124·8	38·0	1·11	15	6·5
Malta	96·3	28	56·5	2	83·4	65·6	61·8	68	153·6	48·6	·00	0	1·3
Cape of Good Hope	79·2	24	34·1	18	63·9	46·6	46·6	85	...	...	3·33	9	4·3
Mauritius	76·6	8	57·3	2	74·9	63·6	59·8	74	120·9	47·9	1·11	11	4·5
Calcutta	97·3	22	71·7	1	90·9	78·3	77·3	81	160·8	69·5	9·15	13	7·6
Bombay	92·8	3	75·2	27	87·5	79·8	77·3	82	143·3	72·2	27·21	20	7·2
Ceylon, Colombo	91·0	1	74·0	15b	87·1	77·9	74·2	81	148·0	72·0	10·94	23	6·7
Melbourne	67·3	1	32·3	21	56·8	44·0	43·5	79	119·4	27·8	1·57	12	6·9
Adelaide	73·4	1	36·1	21	60·2	47·1	45·5	77	128·1	30·6	3·56	15	6·0
Sydney	65·8	11	41·5	28	60·2	49·1	48·0	87	110·0	32·0	6·42	18	5·1
Wellington	61·5	30	35·0	11	55·6	44·6	42·9	77	98·0	23·0	3·27	11	4·7
Auckland	68·0	23	41·5	2	59·6	47·3	44·3	71	112·0	37·0	3·98	12	4·7
Jamaica, Kingston	90·6	15a	70·0	3	87·8	73·1	70·3	71	...	...	3·39	5	...
Trinidad	92·0	3	69·0	c	88·8	70·8	71·7	78	164·0	61·0	6·46	20	...
Grenada	85·4	13	70·0	19	83·2	74·4	73·0	77	144·6	...	10·09	24	3·8
Toronto	90·0	30	45·6	23	74·6	55·9	56·9	73	109·0	...	1·95	8	5·9
New Brunswick, Fredericton	81·7	26	37·0	16	70·0	49·3	49·3	68	...	...	4·81	15	6·9
Manitoba, Winnipeg	85·4	19	32·2	2	71·7	49·0	...	...	...	...	6·10	15	6·6
British Columbia, Esquimalt	81·3	5	42·6	4	65·9	49·1	50·5	82	...	...	1·82	12	5·9

a—and 26. *b*—and 16. *c*—several days.

REMARKS.

CAMDEN SQUARE.—*In the table for April the entries should be: dew point 39°·8; humidity 74; cloud 4·7.*

MALTA.—Mean temp. 73°·4, or 1°·8 above average. Mean hourly velocity of wind 8·6 miles, or 0·1 below the average. Mean temp. of sea 70°·0. Slight earthquake about 11.5 p.m. on 2nd. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 0°·8, and rainfall ·87 in. below, their respective averages. Mean hourly velocity of wind 11·2 miles, or 0·2 below the average; extremes, 30·8 on 7th and 2·4 on 2nd; prevailing direction E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·7, or 0°·7 above, of dew point 0°·1 above, and rainfall 2·69 in. above, their respective averages. Mean hourly velocity of wind 10·1 miles; prevailing direction S.W. T8S on 11 days. H. O. BARNARD.

Adelaide.—A very seasonable month. Mean temp. 0°·1 below, and Rainfall ·79 in. above the mean for 41 years. C. TODD, F.R.S.

Sydney.—Temp. 0°·2 above, humidity 8·5 above, and rainfall ·73 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine weather up to the middle of the month, with occasional showers; strong N.W. winds from 15th to 19th, reaching a gale at times; the remainder showery. H on 30th; frequent fogs; slight earthquake on 27th. Mean temp. 1°·1 above, and rainfall 1·82 below, their respective averages. R. B. GORE.

Auckland.—From 1st to 22nd remarkably fine and dry. Violent N.E. gale on 23rd, with 1·89 in. of R. Then squally and stormy, with frequent heavy showers to the end. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 1·58 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·12	XI.	Builth, Abergwesyn Vic.	6·00
II.	Dorking, Abinger Hall .	4·76	,,	Rhayader, Nantgwillt ...	5·22
,,	Birchington, Thor	2·54	,,	Lake Vyrnwy	5·02
,,	Hailsham	3·54	,,	Corwen, Rhug	2·54
,,	Ryde, Thornbrough	5·30	,,	Criccieth, Talarvor	3·40
,,	Emsworth, Redlands ...	4·59	,,	I. of Man, Douglas	4·55
,,	Alton, Ashdell	4·85	XII.	Stoneykirk, Ardwell Ho.	3·27
III.	Oxford, Magdalen Col..	1·94	,,	New Galloway, Glenlee	6·96
,,	Banbury, Bloxham	2·84	,,	Moniaive, Maxwelton Ho.	5·02
,,	Northampton, Sedgebrook	1·91	,,	Lilliesleaf, Riddell	3·19
,,	Stamford, Duddington..	1·83	XIII.	N. Esk Res. [Penicuick]	7·50
,,	Alconbury	1·15	XIV.	Glasgow, Queen's Park..	4·67
,,	Wisbech, Bank House...	1·63	XV.	Inverary, Newtown	8·69
IV.	Southend	2·19	,,	Ballachulish, Ardsheal...	7·45
,,	Harlow, Sheering..... ...	...	,,	Islay, Gruinart School ...	2·09
,,	Colchester, Lexden	2·16	XVI.	Dollar.....	5·74
,,	Rendlesham Hall	2·66	,,	Balquhidder, Stronvar...	10·62
,,	Scole Rectory	2·41	,,	Coupar Angus Station...	4·98
,,	Swaffham	2·19	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	3·70	XVII.	Keith H.R.S.....	3·97
,,	Bishop's Cannings	3·55	,,	Forres H.R.S.	1·98
,,	Blandford, Whatcombe .	4·33	XVIII.	Fearn, Lower Pitkerrie..	1·77
,,	Ashburton, Holne Vic...	4·27	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	3·53	,,	Invergarry	7·64
,,	Hartland Abbey	2·89	,,	Aviemore H.R.S.	2·26
,,	Lynton, Glenthorne ...	6·57	,,	Loch Ness, Drumnadrochit	4·00
,,	Probus, Lamellyn	4·10	XIX.	Invershin	5·10
,,	Wellington, The Avenue	4·73	,,	Durness	8·19
,,	North Cadbury Rectory	3·34	,,	Watten H.R.S.....	4·43
VI.	Clifton, Pembroke Road	3·16	XX.	Dunmanway, Coolkelure	6·38
,,	Ross, The Graig	1·99	,,	Cork, Wellesley Terrace	2·96
,,	Wem, Clive Vicarage ...	1·96	,,	Killarney, Woodlawn ..	5·83
,,	Wolverhampton, Tettenhall	1·68	,,	Caher, Duneske	4·22
,,	Cheadle, The Heath Ho.	2·57	,,	Ballingarry, Hazelfort...	5·49
,,	Coventry, Priory Row ..	2·18	,,	Limerick, Kilcornan ...	4·13
VII.	Grantham, Stainby	2·38	,,	Broadford, Hurdlestown	4·76
,,	Horncastle, Bucknall ...	1·86	,,	Miltown Malbay	5·28
,,	Worksop, Hodsck Priory	2·48	XXI.	Gorey, Courtown House	3·79
VIII.	Neston, Hinderton	1·33	,,	Athlone, Twyford	3·83
,,	Southport, Hesketh Park	3·02	,,	Mullingar, Belvedere ...	5·22
,,	Chatburn, Middlewood.	4·30	,,	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	3·11	XXII.	Woodlawn	3·90
,,	Scarborough, Observat'y	...	,,	Crossmolina, Enniscoe ..	8·12
,,	Middleton, Mickleton ...	1·87	,,	Collooney, Markree Obs.	3·59
X.	Haltwhistle, Unthank...	3·40	,,	Ballinamore, Lawderdale	...
,,	Bamburgh	3·25	XXIII.	Warrenpoint.....	3·04
,,	Duddon Valley, Ulpha School	7·31	,,	Seaforde.....	3·15
,,	Keswick, The Bank.....	7·84	,,	Belfast, Springfield	3·64
XI.	Llanfrechfa Grange	5·15	,,	Bushmills, Dundarave..	3·34
,,	Llandovery	4·28	,,	Stewartstown	3·62
,,	Castle Malgwyn	4·77	,,	Killybegs	8·93
,,	Brecknock, The Barracks	2·72	,,	Horn Head	5·68

NOVEMBER, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATUR Max. Deg.	Max. Date	Min Deg.
			inches.	inches.	in.					
I.	ENGLAND.	London (Camden Square) ...	1·94	— ·72	·56	25	13	60·6	3	27·3
II.		Tenterden	2·28	— 1·11	·56	23	17	61·7	9	26·0
,,		Hartley Wintney	3·45	...	1·23	23	14	60·0	3	25·0
III.		Hitchin	2·31	— ·37	·44	23	16	60·0	2, 3	25·0
,,		Winslow (Addington)	1·82	— 1·11	·37	23	13	60·0	2	23·0
IV.		Bury St. Edmunds (Westley)	2·33	— ·22	·57	26	16	59·0	2	28·0
,,		Norwich (Brundall)	3·00	...	·92	26	19	60·8	2	29·2
V.		Winterbourne Steepleton ...	5·16	...	1·59	23	17	51·8	16	28·3
,,		Torquay (Cary Green)	3·99	...	1·10	23	14	60·9	16	32·2
,,		Polapit Tamar [Launceston]..	2·57	— 1·77	·51	24	18	60·5	11	27·1
VI.		Stroud (Upfield)	2·61	— ·72	·75	24	18	58·0	2, 3	28·0
,,		ChurchStretton(Woolstaston)	1·53	— 1·99	·39	24	18	59·0	16	26·0
,,		Worcester (Diglis Lock)	1·62	— 1·22	·35	25	12	...	...	...
VII.		Leicester (Rotherby Hall) ...	...	...	...	..	...	...	...	...
,,		Boston	1·60	— ·60	·52	26	15	60·0	2	26·0
,,		Hesley Hall [Tickhill].....	2·06	+ ·04	·75	23	18	61·0	2	25·0
VIII.		Manchester(PlymouthGrove)	1·95	— 1·05	·49	12	15	61·0	9	27·0
IX.		Wetherby (Ribston Hall) ..	3·50	+ 1·43	·95	23	17	...	...	...
,,		Skipton (Arncliffe)	3·62	— 3·13	·63	2	24	...	...	...
,,		Hull (Pearson Park).	2·24	+ ·23	·59	23	18	61·0	8, 15	26·0
X.		Newcastle (Town Moor)	3·30	+ ·90	·70	25	13	...	...	...
,,		Borrowdale (Seathwaite).....	16·85	+ 2·06	5·20?	1	20	...	...	...
XI.	WALES.	Cardiff (Ely).....	5·06	+ ·15	1·29	2	22	...	...	...
,,		Haverfordwest	6·09	+ ·23	1·27	22	24	58·7	3	33·7
,,		Aberystwith (Gogerddan) ...	3·92	— 1·19	·94	4	16	58·0	11	...
,,		Llandudno.....	1·87	— 1·22	·38	12	20	63·0	2	29·0
XII.	SCOTLAND.	Cargen [Dumfries]	5·64	+ 1·08	2·18	1	15	58·0	2	19·0
XIII.		Edinburgh (Blacket Place)...	4·11	...	·90	25	20	61·0	2	20·3
XIV.		Colmonell	5·51	...	1·36	22	17	61·0	8	19·0
XV.		Tighnabruaich	6·81	...	1·33	1	21	53·0	1, 2	25·0
,,		Mull (Quinish).....	6·10	— ·89	2·01	1	20	...	...	...
XVI.		Loch Leven Sluices	5·90	+ 1·94	1·30	2	13	...	...	...
,,		Dundee (Eastern Necropolis)	4·35	+ 1·65	1·25	23	21	59·0	2	21·0
XVII.		Braemar	4·64	+ ·06	1·23	25	18	55·0	2	8·5
,,		Aberdeen (Cranford)	4·14	...	·80	12	20	59·0	2	19·0
,,		Cawdor (Budgate)	3·11	+ ·26	·78	12	17	...	...	...
XVIII		Strathconan [Beauly]	8·44	+ 1·88	1·60	2	14	...	...	...
,,		Gleucarron Lodge.....	9·06	...	2·67	1	20	61·0	12	17·6
XIX.		Dunrobin	3·82	+ ·99	·77	4	18	56·0	18	23·0
,,		S. Ronaldshay (Roeberry) ...	6·15	+ 2·73	1·57	23	23	52·0	7*b*	26·0
XX.	IRELAND.	Darrynane Abbey.....	6·60	...	1·14	23	26	...	...	...
,,		Waterford (Brook Lodge) ...	2·95	— ·72	·50	22*a*	20	59·5	2	28·0
,,		O'Briensbridge (Ross)	6·80	...	1·25	22	19	...	...	...
XXI.		Carlow (Browne's Hill)	4·41	— 1·35	1·04	23	16	...	...	...
,,		Dublin (FitzWilliam Square)	4·44	+ 1·61	1·73	23	17	62·7	2	29·0
XXII.		Ballinasloe	4·10	+ ·19	·62	22	23	56·0	2	30·0
,,		Clifden (Kylemore)	10·48	...	1·93	22	25	...	...	...
XXIII		Waringstown	2·98	— ·12	·42	29	18	59·0	3, 4	25·0
,,		Londonderry (Creggan Res.).	4·47	— ·05	·81	24	21	...	...	...
,,		Omagh (Edenfel)	3·85	— ·02	·56	3	16	58·0	2	27·0

+ Shows that the fall was above the average ; — that it was below it.

a—and 23. *b*—and 18, 19. *c*—and 30. *d*—and 23. *e*—and 29.

METEOROLOGICAL NOTES ON NOVEMBER, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Warm and dry till the 20th, after which 1·85 in. of R fell, but the total is only two-thirds of the average. Duration of sunshine 89 hours. Gardens were gay with flowers until the 22nd. Fog on 8th, 10th, 11th, and 14th. On 3rd the shade min. was 52°, and the grass min. 51°. S on 29th.

HARTLEY WINTNEY.—From 7th to 20th consisted of many calm days, with alternations of sun and fog, mildness, and little R; from 20th to the end was cold, dull, and wet. Oaks were in full leaf till 23rd, and heliotrope, dahlias, and begonias, were blooming till cut off by the frost on that day. Six hours' sunshine was recorded on 13th and on 22nd. L on 12th. Rainfall 1·06 in. above the average, and for the first 11 months of the year 4·20 in. below it.

ADDINGTON.—Generally very mild, with frequent fogs and hardly any frost until the evening of 22nd. On the morning of 23rd the ground was covered with about two inches of S, but R following, it did not remain long. Many tender plants were in flower, untouched by frost until 22nd; unusually late for dahlias, heliotrope, &c., to be seen in such fine condition. Fog on 10 days.

BURY ST. EDMUNDS, WESTLEY.—Very mild until 23rd, when the first frost cut tender plants in the gardens. The chalk wells at the close were shorter of water than had ever before been known.

NORWICH, BRUNDALL.—Very mild during the greater part of the month, the mean. temp of the first 19 days being identical with that of the first 19 days of last May. A high relative humidity was recorded, the mean 9 a.m. value for the month being 94. Fog on 9th, 10th and 11th. Gales from N.W. and N. on 21st, and N.E. on 28th. H and sleet on 22nd. Incessant R on 26th.

WINTERBOURNE STEEPLETON.—In the 32 days ending November 7th R was registered on all but 4, and on 20th another wet period began, with very low bar., high wind and heavy rains, and T and H on 25th. The mean temp. 45°·4, is 1°·1 above the average of 5 years. Fog daily from 9th to 12th.

TORQUAY, CARY GREEN.—November rainfall ·08 in. above the average, but total for the first 11 months of the year 7·06 in. below it. Mean temp. 49°·4, or 2°·2 above the average. Duration of sunshine 56 hours 40 mins., being 4 hours 25 mins. below the average; 12 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Though generally damp, the rainfall for the month is very small. The total R for the first 11 months of the year is 3·71 in. less than the average. The prevailing characteristic was general absence of wind. Very thick fog on 6th, slight on 26th.

WOOLSTASTON.—The first three weeks were mild, dark and damp, with a great deal of fog. A heavy gale with driving S raged on 22nd and 23rd. Mean temp. 43°·9.

BOSTON.—Weather remarkably open except at the end of the month. Mean temp. 3°·5 above the average. Plums, apples and raspberries (due to a second crop) were gathered at the beginning of the month. Thrushes singing as if it were spring.

WALES.

HAVERFORDWEST.—The month was characterized by wet, with unusual mildness. Heavy squalls occurred on the morning of 13th, accompanied by T, L and very heavy R, and a short but severe TS on 25th, between 5 and 6.30 p.m. In the parish of Slebech, and on the Precelly range, torrents of R and H fell, doing great damage to the roads.

GOGERDDAN.—Very mild and damp, with very little sunshine. A little S on 28th.

SCOTLAND.

CARGEN [DUMFRIES].—The weather was dull and unsettled, with exceptionally low bar. pressure. The temp. was high up to the evening of the 19th; the mean from 1st to 18th being 46°, and from 19th to 30th 36°, but was very variable during the last 12 days; the mean on 26th being 42°, and on 29th 24°. On 1st 2·18 in. of R fell, the greatest recorded, with one exception, since observations commenced in 1860; the total for the 1st and 2nd, 2·74 in., also has only once been exceeded. A large area was flooded, but the tides being "neap," there was no damage from overflow of the Nith embankments. L on 3rd. S on 22nd and 29th. E. winds prevailed on 16 days, and sunshine was conspicuously absent. Strawberries show well-developed fruit, while snowdrops have been seen in full flower bud. R for the first 11 months of the year slightly above the average.

EDINBURGH, BLACKET PLACE.—Mean temp. 1°·6 above, and rainfall 56 per cent. in excess of, the average. Sunshine only half the mean. TS and H on 3rd; dense fog daily from 9th to 12th; S on 22nd, 23rd and 29th.

COLMONELL.—R ·30 in. more than, and mean temp. 2°·6 above, the average of 22 years. Many sheep on the hills covered by S on 22nd. L on 2nd.

TIGHNABRUAICH.—A wet, stormy month. Four inches of S on the ground on 22nd.

ABERDEEN, CRANFORD.—A very mild month, flowers blooming to the end in the open garden. Gales and heavy R from 22nd to 25th.

S. RONALDSHAY, ROEBERRY.—A cold, wet month. Mean temp. 42°·2, or 1°·0 below the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—The first three weeks were mild, but from 21st to 28th was very cold. On 22nd, 23rd and 24th, 3·02 in. of R fell, accompanied by a strong N.E. gale. N.W. gale on 12th.

WATERFORD, BROOK LODGE.—S on the Comeragh mountains on 13th, and a fresh fall on 23rd.

O'BRIENSBRIDGE, ROSS.—Wild and wintry from beginning to end.

DUBLIN, FITZWILLIAM SQUARE.—Opening mild and changeable, with fresh S.W. winds, it afterwards became fine, quiet, and at times foggy. A brief period of frost on 22nd was followed by exceptionally heavy R, so that in 4 days 3·23 in. fell. High winds on 7 days, and a gale on 2nd and 3rd. Fog on 7 days. Solar halos on 1st and 22nd. H, or sleet and S, on 4 days. L on 3 days, and TS on 26th.

OMAGH, EDENFEL.—The weather continued extraordinarily fine and mild until the 22nd, when a series of violent gales from E. and N.E. completely changed its character and occasioned much damage over the country. The end of the month was finer.

o. CCCXCVI.]
VOL. XXXIII.

[PRICE FOURPENCE.
Or 5s. per annum, post free.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE
Royal Meteorological Society	177
Godfridus—The Book of Knowledge	179
REVIEW:—	
Etudes internationales des Nuages. 1896 and 1897	181
Aurora and Storms	182
Results of Meteorological Observations at Camden Square during December for 40 years, 1858–97	183
Climatological Table for the British Empire, July, 1898	184
Supplementary Table of Rainfall, December, 1898	185
Rainfall and Temperature in December, 1898, at 50 Stations	186
Meteorological Notes on December, 1898	187
TITLE AND INDEX TO VOL. XXXIII.	

JANUARY, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy
Meteorological Societies, and of the British Astronomical Association; Artic
by various eminent Astronomers, English, American, and Continenta
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assista
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu
publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observato
Royal Observatory, Greenwich, S.E.

Annual Subscription for the "Companion" and twelve Monthly Numbers, 1

NOTICES.

It is requested that all Books for Review, and Communications
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in
letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCVI.] JANUARY, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

The following candidates were balloted for and duly elected Fellows of the Society:—John Alfred Curtis; John Dickinson Leigh, M.B., M.S., F.R.C.S. (Edin.); H. Bertram Nichols, A.M.I.C.E.

WEST INDIA HURRICANE.

Capt. A. Carpenter, R.N., D.S.O., gave an account of the hurricane which caused so much devastation in the West Indies in Sept., 1898.

The cyclone, passing 18 miles south of Barbadoes, swept over the southern half of St. Vincent Island, then took a north-west direction towards Aves Island, its rate of progression being about 7½ miles an hour. From here it pursued a northerly course for 450 miles, passing between Puerto Rico and the Windward Islands. In lat. 23° N. it swerved to the north-west for 600 miles up to lat. 30° N., where, on the 17th, it commenced to recurve to the north-east. It was traced to lat. 44° N., long. 42° W., where it was still going strong on the 20th, having travelled 3000 miles at an average speed before recurvature of 8 miles an hour, and of 24 miles an hour afterwards.

Its diameter (taken as the limit within which there was a marked change in direction of wind) was 80 miles as it approached Barbadoes, and 170 miles after leaving St. Vincent. The actual storm centre, in which the force of wind greatly increased, was only 35 miles in diameter until St. Vincent was passed, but after that the strength of wind extended to 170 miles. The diameter of the calm vortex, or eye, of the storm was not less than 4 miles.

On nearing Bermuda the diameter of the cyclone was about 400 miles, and on passing Nova Scotia 450 miles, as depicted on the U.S. *Pilot Chart* for November.

The damage to the islands was very great. The houses of the peasantry are all of wood, and those of Europeans only of stone or brick in their lower courses.

In Barbadoes 11,400 houses were swept away or blown down. Some of these fell outward from all sides as if by an explosion from the

interior. About 115 persons were killed, and 50,000 became homeless.

At St. Vincent 6,000 houses were blown down or damaged beyond repair, 200 lives lost, and 20,000 people homeless. Not only were wooden houses blown down, but nearly all the churches and chapels were destroyed. Trees nearly a century old were uprooted, and the rain filled the mountain torrents to such magnitude that whole villages were swept away and estates wiped out beyond recognition. The high sea damaged Kingstown, and all shipping was destroyed. At the Botanic Gardens on the 11th the barometer fell from 29·539 in. at 10 a.m. to 28·509 in. at 11.40 a.m., and about 14 inches of rain fell in the 24 hours ending 9 a.m. on 12th. The rain at Fort Charlotte, overlooking Kingstown, was said to be "scalding hot" and smelt putrid, and clothes that got wet rotted after being washed. The volcano Soufrière, at the north end of the island, has been dormant since 1812. A lake, half a mile in diameter, lies in the crater. It seems possible that this water, which under a tropical sun must bear a high temperature and be somewhat foul, may have been licked up by the cyclonic whirl, and descended as stinking rain.

At St. Lucia the rain converted valleys into lakes, and an avalanche filled a valley for 3 miles, burying houses and estates. The high sea did much damage at Castries Harbour.

The same tale is told farther north, the heavy rain doing even more harm than the wind.

There was much atmospheric electricity over all the islands from the 10th to the 14th.

The surf was roaring on the east coast of St. Vincent twenty hours before the cyclonic centre reached it.

It does not appear that any of the meteorological observers have made arrangements for receiving reports of the height and direction of the ocean swell from the weather coasts during the hurricane months. The author feels sure that they lose a very valuable warning by not doing so. The following facts give another illustration of the warning thus afforded.

In August, 1880, at Port Royal, Jamaica, the author received nearly twenty-four hours' notice of the cyclone that swept over the island, wrecking every vessel except the Commodore's ship and his own little surveying schooner. None of the local folk saw anything unusual in the look of the weather, but the sea outside on the reefs was far greater than that due to the ordinary sea breeze.*

* Since the above paper was read we have received the *U.S. Monthly Weather Review* for September, 1898, which contains details as to the storm warning system which the English Government ought to have established 30 years ago, but which the U.S. Government have now the honour of providing for all nations. It contains also note of the early work of the observers respecting this Hurricane, and a chart of its track, which seems to be more westerly than that described by Capt. Carpenter; in fact, more like the normal tracks in the old works of Sir W. Reid and others published in the early part of this century, but we have not Capt. Carpenter's chart before us, and we hope that we have not heard the last of this storm.—Ed. *M. M.*

FROST AND ANTICYCLONES.

Mr. W. H. Dines, B.A., read a paper on the connection between the winter temperature and the height of the barometer in north-western Europe.

In the spring of 1897 the author read a paper before the Society dealing with the connection between frost and anticyclonic conditions at Greenwich. The period dealt with was 1841-90 inclusive, and the statistical evidence obtained left no doubt on his mind that the current theory on the subject is radically false. In that paper it was shown that the mean height of the barometer during nearly all the noted frosts of the period was below the average, and that 16 frosts only out of 74 had been accompanied by a high barometer (above 30·20 ins.), and that, whereas the average duration of a frost was 9 days, the average of those 16 high barometer frosts was only 6 days. The present paper is a further contribution to the subject based on observations at Christiania 1868-93, Berlin 1848-93 and Geneva 1840-95, and the author sums up as follows.

"Thus the three different ways in which the question has been investigated give the same answer, namely, that the winter temperature at a place in Western Europe has no connection with the height of the barometer at that place, and that in winter it is just as likely to be cold when the barometer is below the average as when it is above the average."

These papers are an important criticism of a somewhat fundamental question and the acceptance of the author's conclusions would, as was stated in the discussion, necessitate the rewriting of nearly all the Meteorological text books. We much regret that it is impossible to do justice the paper or to report the discussion by Messrs. F. C. Bayard, C. Harding, F. J. Brodie, R. H. Scott, G. J. Symons and Major Rawson, without reproducing the diagrams which we should scarcely be justified in doing before they appear in the Quarterly Journal of the Society.

GODFRIDUS—THE BOOK OF KNOWLEDGE.

In Vol. XXXI., pp. 101–106 and 114–115, we enumerated and partly described the contents of such editions of the above work as we had been able to trace, and intimated that a complete bibliography would require much work. Since then we have succeeded in purchasing several editions which at that time we had to describe on the authority of bibliographers, and we have at least three editions not quoted in that list. We do not, however, think that the time to revise and complete the account has yet come; on the contrary, it seems more remote, for one copy (of 1766) claims the parentage of Lilly the Astrologer (1602–1681), and another drops Godfridus, Melampus, Erra Pater and Lilly, and starts with a fresh title as below.

We reprint the title nearly in fac-simile in order that our readers may know the style of book for which we are searching.

The NEWEST, BEST,
And Very-much Esteemed
BOOK *of* KNOWLEDGE.
Being *Very Necessary* and *Useful* for the *Instruction* and *Benefit* of all Persons.

SHEWING

The Effects of the PLANETS and other Astronomical CONSTELLATIONS; with the Strange Events that happen to *Men*, *Women*, and *Children*, Born under them.

Together with

The *Husbandman's Practice:* Or, *Prognostication for Ever.* And the *Shepherd's Perpetual Calendar* for the *Weather.*

ALSO

A Brief Discourse of the Natural Causes of *Meteors;* with an Account of several Remarkable *Earthquakes, Rains, Thunders, Thunder-Bolts, Lightnings, Comets, Blazing-Stars,* &c.

AND

Observations on the *Weather,* and *Signs* foretelling *Rain.*—A Brief Collection of all the *Members* of *Man* Physiognomiz'd.—*Signification* of *Moles* on *Man* or *Woman.*–*Interpretation* of *Dreams.*–And *Pythagoras's Wheel* of *Fortune.*

WITH

A Particular Account of the *Earth* and *Sea:* And a Description of the most Magnificent *Temple* of *Solomon:* Also of the *Seven Wonders* of the *World*

LONDON:
Printed for A. WILDE, in *Aldersgate-Street:* Sold *also by the* BOOK-SELLERS *in* Town *and* Country. 1764.

It is a 12mo, of 156 pages, on very poor paper, and evidently owes its preservation to having been strongly bound. It will be noticed that the title has been quite changed, and, in fact, the book is more like a popular treatise on the weather.

The following lines front the title page. *Mirabile dictu* they are not in Inwards's *Weather Lore;* perhaps Mr. Inwards will put them in his 4th edition. To us they are suggestive of the well-known lines, "The hollow winds begin to blow," &c., which are attributed to Dr. E. Darwin and to Dr. Jenner. It will be interesting to find which was published first.

Infallible Signs *of* Rainy Weather, *from the Observation of* divers Animals.

IF *Ducks* or *Drakes* their Wings do flutter high,
Or tender *Colts* upon their Backs do lie;
If *Sheep* do bleat, or play, or skip about,
Or *Swine* hide Straw by bearing on their Snout;
If *Oxen* lick themselves against the Hair,
Or grazing *Kine* to feed apace appear,
If *Cattle* bellow, gazing* from below,
Or if *Dogs* Entrails rumble to and fro,
If *Doves* or *Pigeons* in the Evening come
Later than usual to their Dove-House Home;
If *Crows* and *Daws* do oft themselves be-wet,
Or *Ants* and *Pismires* Home a-pace do get;
If in the Dust *Hens* do their Pinions shake,
Or by their flocking a great Number make;
If *Swallows* fly upon the Water low,
Or *Wood-Lice* seem in Armies for to go;
If *Flies*, or *Gnats*, or *Fleas* infest and bite,
Or sting more than they're wont by Day or Night;
If *Toads* hie Home, or *Frogs* do croak amain,
Or *Peacocks* cry:——*Soon after look for Rain.*

REVIEW.

Etudes internationales des Nuages. 1896 and 1897. *Observations et Mésures de la Suède I, II. Publication de l'Observatoire Météorologique de l'Université Roy. d'Upsala.* 4to. [1898.] 134 pp., 1 plate.

ENGLAND is, we fear, being left behind as regards meteorology.

Welsh and Glaisher may be said to have originated high-class work in balloons, but what followers have they here now? The French, Germans, and Russians are devoting time and money to it, and, we believe, actually sent an aeronaut to this country.

Douglas Archibald led the way with kites years ago, but what are we now doing? It is to Lawrence Rotch and to the U.S. Weather Bureau that we have to look.

Howard started the nomenclature of clouds, Whipple worked at determining their height, and Clayden is still doing his best single-

* ? Grazing.

handed and at his own cost. But what have we to put by the side of the work of Hildebrandsson and Teisserenc de Bort?

Somebody ought to ponder over the explanation of these facts.

We, however, have merely to indicate the character and contents of the work before us.

In the first ten pages Dr. Hildebrandsson gives an historical sketch of cloud work, from the time (just 25 years ago) when he first organised the Swedish corps of Cirrus observers, down to the meeting of the International Conference at Paris in 1896. We see no English names quoted but those of Ralph Abercromby and Ley, and excepting Clayden, Whipple, and Wilson Barker, we remember no other Englishman who has worked regularly at the subject. In 1874 it was resolved that, "*Toutes les Institutions Météorologiques centrales sont invitées à organiser une première série d'observations et de mesures des nuages pendant une année, du* 1*er Mai* 1896, *à* 1*er Mai* 1897." This volume gives the results for Upsala—time will show what other countries have done.

Part II. describes the instruments used, their position, and the methods by which the altitudes of the clouds were computed. The theodolites are much smaller than those used by M. Teisserenc de Bort at his observatory at Trappes; but Dr. Hildebrandsson seems satisfied that they were quite free from error, and as the base line was rather more than half a mile in length, the angles were usually considerable.

Part III. gives the observations *in extenso* and some summaries; we cannot go fully into these, but may note in conclusion that according to Fig. 3, when the pressure at sea-level is about 30·4 in., the cirri have an altitude of five miles; the highest seems to have been six miles at 7.5 p.m. on April 27th, 1897.

AURORÆ AND STORMS.

To the Editor of the Meteorological Magazine.

SIR,—In the December number, at page 164, you put a query in a note at the foot of the page in reference to displays of the aurora, asking for proof that they foretell storms.

An old friend of mine told me 40 years ago that a relation of his, who commanded for two or three years a cruiser in the Channel, had observed that whenever an aurora appeared the wind would blow hard from the S.W. in 48 hours. I have myself verified this as the unfailing result of my own observation ever since.

Your obedient servant,

JOHN SLATTER.

Whitchurch, Oxon., 19th December, 1898.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

DECEMBER.

ELEMENTS.	MONTHLY MEANS OR TOTALS.									ABSOLUTE READINGS.					
				MEANS 9 A.M. AND 9 P.M.						EXTREMES AT 9 A.M. AND 9 P.M.					
						Highest Month.		Lowest Month.		Highest.		Lowest.			
	Mean, 40 years	Highest Month and Date.	Lowest Month and Date.		Mean.	Value.	Date.	Value.	Date.	Value.	Date.	Value.	Date.	Mean of all Highest	Mean of all Lowest.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Barometer (cor. & red.)	29·947	30·312 1879	29·481 1876	9 a.m. 9 p.m.	29·948 29·945	30·320 30·304	1879 1879	29·483 29·479	1876 1876	30·784 30·782	23rd, 1879 15th, 1865	28·398 28·323	4th, 1876 8th, 1886	30·498 30·494	29·174 29·200
Shade Temp. Dry Bulb	39·3	46·2 1868	30·3 1890	9 a.m. 9 p.m.	39·0 39·6	46·1 46·4	1868 1868	29·7 30·8	1890 1890	56·0 56·5	14th, 1870 6th, 1866	12·1 17·3	25th, 1860 24th, 1860	51·6 51·7	26·4 27·5
Shade Temp. Max.	44·0	..	...	...	...	50·7	1868	34·0	1890	58·9	5th, 1888	24·3	31st, 1874	54·5	32·7
Shade Temp. Min.	34·4	...	...	...	...	41·0	1868	25·5	1890	52·8	28th, 1882	6·7	25th, 1860	46·8	22·9
Shade Temp. Wet Bulb	38·1	44·9 1868	29·6 1890	9 a.m. 9 p.m.	37·8 38·3	44·6 45·1	1868 1868	29·1 30·1	1890 1890	54·8 55·8	14th, 1870 6th, 1868	11·9 16·9	25th, 1860 24th, 1860	50·3 50·3	25·8 26·7
Solar Rad., black	51·8	...	...	...	...	59·1	1880	36·9	1890	87·0	10th, 1880	24·8	31st, 1874	71·3	34·3
Solar Rad., bright	44·9	...	...	...	...	48·3	1894	34·8	1890	62·0	5th, 1888	26·8	21st, 1891	56·8	33·3
Grass Minimum	30·9	...	..	...	...	37·4	1876	22·0	1890	51·2	5th, 1866	1·8	25th, 1860	44·0	18·5
Soil, 1 foot	39·9	...	...	...	...	43·0	'72, '76	33·6	1879	47·9	6th, 1888	32·7	25, 27, 28, '78	44·0	36·3
Cloud	6·8	8·1 '76, '90	5·2 1886	9 a.m. 9 p.m.	6·8 6·7	8·6 8·1	1890 1870	5·2 5·0	1885 1886	10 10	Every year Every year	0 0	Various Various	10·0 10·0	0·6 0·2
Rainfall	2·13	6·25 1876	·36 1864	9 a.m. 9 p.m.	1·11 1·02	3·13 3·12	1876 1876	·19 ·17	'64, '79 '64, '73	1·14 ·85	24th, 1876 26th, 1886	·00 ·00	Every year Every year	·36 ·32	·00 ·00

Max. Rainfall in 24 hours, 1·82 in., 26th, 1886. Mean max. daily fall, ·54 in.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	82·9	15	43·9	11	73·8	53·5	51·5	69	127·7	39·1	1·09	7	6·1
Malta	95·7	22	64·4	17	85·0	69·0	63·9	69	153·5	57·1	·00	0	1·1
Cape of Good Hope	78·4	26	34·3	9	61·9	46·7	45·1	84	...	...	6·13	13	5·3
Mauritius	76·0	15*a*	56·7	2	74·2	63·9	58·9	72	123·0	49·0	1·72	15	5·5
Calcutta	92·1	25	75·4	17	87·0	78·1	77·9	88	155·5	74·9	12·75	28	8·8
Bombay	86·7	4	73·7	23	84·2	77·6	76·8	87	137·5	73·2	20·72	31	9·2
Ceylon, Colombo	89·2	24	72·5	9	86·8	78·0	73·2	78	146·5	70·5	6·15	13	6·3
Melbourne	64·0	14	35·0	2	55·7	43·4	41·7	77	121·0	27·3	1·90	12	6·4
Adelaide	64·7	13	38·0	17	59·1	45·2	43·7	77	122·8	29·2	2·65	16	6·0
Sydney	70·1	27	40·4	20	58·7	45·3	40·0	80	144·3	28·0	3·73	10	2·9
Wellington	63·0	17	33·8	9	55·3	41·7	39·3	70	96·0	21·0	4·80	17	4·2
Auckland	62·0	26	41·0	21	58·1	49·9	45·5	78	110·0	38·0	6·18	23	6·1
Jamaica, Kingston	91·8	3, 29	70·3	19	88·7	72·8	70·2	70	...	...	1·63	7	...
Trinidad	93·0	19	68·0	11*c*	88·8	70·8	72·0	78	165·0	66·0	5·87	18	...
Grenada	84·2	1*b*	70·8	13	82·6	74·1	71·3	80	151·0	...	10·24	26	3·0
Toronto	94·0	3	43·3	11	81·5	60·2	59·9	68	123·5	35·5	·69	9	3·6
New Brunswick, Fredericton	93·9	3	42·5	6	78·0	51·6	56·3	62	...	...	1·98	10	4·9
Manitoba, Winnipeg	91·5	13	37·5	20	77·4	54·0	...	...	...	...	1·77	9	5·5
British Columbia, Esquimalt	79·6	30	46·2	7	69·8	50·6	54·6	85	...	...	·28	3	2·7

a—and 17. *b*—and 12, 22, 28. *c*—and 12.

REMARKS.

MALTA.—Mean temp. 75°·1, or 2°·5 below average. Mean hourly velocity of wind 9·2, or 1·7 above average. Mean temp. of sea 78°·5. L on 3 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·5, and rainfall ·52 in. below, the average. Mean hourly velocity of wind 12·3 miles, or 0·5 above average; extremes, 30·5 on 27th and 2·1 on 19th; prevailing direction E.S.E. T on 22nd—the first time on record in July. The lowest barometer ever recorded in July (29·895 in.) occurred on 19th during the passage of bad weather to S. and S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·6, or 1°·0 above, of dew point 0°·2 below, and rainfall 1·72 in. above, average. T8S on 3 days; L on 4 days. Mean hourly velocity of wind 9·7 miles; prevailing direction S.W. H. O. BARNARD.

Adelaide.—Mean temp. 0°·6 above, and rainfall slightly more than, the average of 41 years. Fair during the first half, but during the latter half generally squally and showery. C. TODD, F.R.S.

Sydney.—Temp. 0°·4 below, humidity 3·4 above, and rainfall ·55 in. below, average. Frequent light rains, meeting all requirements for wheat and grass, but not enough for tanks and rivers. H. C. RUSSELL, F.R.S.

Wellington.—Showery weather up to the middle, with S.E. and N.W. winds, at times strong, then fine, bright and cold up to 22nd; from 23rd to the end wet, and strong N.W. winds on 27th and 28th. T on 7th and 28th; H on 7th and 8th; fog on 9th; S on hills on 25th and 31st. Earthquakes on 5th and 8th. R. B. GORE.

Auckland.—Beginning and end of the month wet and stormy, middle fine and dry. Mean temp. slightly below, and rainfall 1·25 in. above, average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 3·58 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1898.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·32	XI.	Builth, Abergwesyn Vic.	12·13
II.	Dorking, Abinger Hall .	3·41	,,	Rhayader, Nantgwillt...	8·32
,,	Birchington, Thor	1·29	,,	Lake Vyrnwy	9·73
,,	Hailsham	3·05	,,	Corwen, Rhug	4·26
,,	Ryde, Thornbrough	3·33	,,	Criccieth, Talarvor	3·79
,,	Emsworth, Redlands ...	3·05	,,	I. of Man, Douglas	4·55
,,	Alton, Ashdell	3·81	XII.	Stoneykirk, Ardwell Ho.	2·44
III.	Oxford, Magdalen Col..	2·18	,,	New Galloway, Glenlee	8·41
,,	Banbury, Bloxham	2·73	,,	Moniaive, Maxwelton Ho.	6·88
,,	Northampton, Sedgebrook	2·18	,,	Lilliesleaf, Riddell	3·05
,,	Stamford, Duddington..	1·96	XIII.	N. Esk Res. [Penicuick]	6·00
,,	Alconbury	1·74	XIV.	Glasgow, Queen's Park..	6·32
,,	Wisbech, Bank House...	1·84	XV.	Inverary, Newtown	16·24
IV.	Southend	1·80	,,	Ballachulish, Ardsheal...	16·67
,,	Harlow, Sheering..... ...	2·02	,,	Islay, Gruinart School ...	..
,,	Colchester, Lexden	2·36	XVI.	Dollar.....	5·31
,,	Rendlesham Hall	3·12	,,	Balquhidder, Stronvar...	18·01
,,	Scole Rectory	2·25	,,	Coupar Angus Station...	2·75
,,	Swaffham	2·15	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	2·93	XVII.	Keith H.R.S.....	3·72
,,	Bishop's Cannings	3·20	,,	Forres H.R.S.	3·51
,,	Blandford, Whatcombe .	4·34	XVIII.	Fearn, Lower Pitkerrie..	4·24
,,	Ashburton, Holne Vic...	6·56	,,	N. Uist, Loch Maddy ...	...
,,	Okehampton, Oaklands.	6·80	,,	Invergarry	17·45
,,	Hartland Abbey	5·40	,,	Aviemore H.R.S.	3·86
,,	Lynton, Glenthorne ...	6·91	,,	Loch Ness, Drumnadrochit	9·73
,,	Probus, Lamellyn	4·65	XIX.	Invershin	4·76
,,	Wellington, The Avenue	3·20	,,	Durness	10·07
,,	North Cadbury Rectory	2·52	,,	Watten H.R.S.....	3·61
VI.	Clifton, Pembroke Road	4·49	XX.	Dunmanway, Coolkelure	8·72
,,	Ross, The Graig	2·58	,,	Cork, Wellesley Terrace	2·95
,,	Wem, Clive Vicarage ...	2·44	,,	Killarney, Woodlawn ..	7·66
,,	Wolverhampton, Tettenhall	2·21	,,	Caher, Duneske	2·25
,,	Cheadle, The Heath Ho.	2·45	,,	Ballingarry, Hazelfort...	2·42
,,	Coventry, Priory Row ..	2·58	,,	Limerick, Kilcornan ...	1·71
VII.	Grantham, Stainby	1·81	,,	Broadford, Hurdlestown	2·94
,,	Horncastle, Bucknall ...	1·92	,,	Miltown Malbay	5·29
,,	Worksop, Hodsck Priory	2·00	XXI.	Gorey, Courtown House	2·09
VIII.	Neston, Hinderton	1·77	,,	Athlone, Twyford	2·26
,,	Southport, Hesketh Park	2·48	,,	Mullingar, Belvedere ...	2·03
,,	Chatburn, Middlewood.	5·79	,,	Longford, Currygrane...	...
IX.	Melmerby, Baldersby ...	1·96	XXII.	Woodlawn	2·93
,,	Scarborough, Observat'y	2·06	,,	Crossmolina, Enniscoe ..	8·61
,,	Middleton, Mickleton ...	4·31	,,	Collooney, Markree Obs.	4·14
X.	Haltwhistle, Unthank...	4·58	,,	Ballinamore, Lawderdale	4·10
,,	Bamburgh	1·39	XXIII.	Warrenpoint.....	2·65
,,	Duddon Valley, Ulpha School	8·35	,,	Seaforde.....	2·69
,,	Keswick, The Bank.....	11·52	,,	Belfast, Springfield	2·97
XI.	Llanfrechfa Grange	5·28	,,	Bushmills, Dundarave..	2·63
,,	Llandovery	6·94	,,	Stewartstown	3·01
,,	Castle Malgwyn	6·59	,,	Killybegs	8·19
,,	Brecknock, The Barracks	5·16	,,	Horn Head	7·13

DECEMBER, 1898.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Dat
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	2·54	+ ·47	·87	6	12	57·1	4	27·1	24
II.		Tenterden	2·13	— ·50	·37	31	15	55·0	4, 6	26·0	31
,,		Hartley Wintney	2·72	...	·87	6	16	57·0	7	24·0	22
III.		Hitchin	2·81	+ ·78	·79	6	14	57·0	6	26·0	30
,,		Winslow (Addington)	3·18	+ ·72	1·18	6	16	56·0	4, 18	25·0	31
IV.		Bury St. Edmunds (Westley)	2·49	+ ·25	·79	6	11	57·0	5	21·0	23
,,		Norwich (Brundall)	2·31	...	·46	6	14	56·0	4, 18	26·2	31
V.		Winterbourne Steepleton ...	4·76	...	1·06	6	20	54·1	5, 26	25·0	31
,,		Torquay (Cary Green)	3·79	...	·96	27	16	56·4	5, 26	34·6	21
,,		Polapit Tamar [Launceston]..	4·73	+ ·50	·82	6	24	56·9	26	27·4	21
VI.		Stroud (Upfield)	3·20	+ ·75	·93	6	14	57·0	8	28·0	22
,,		ChurchStretton(Woolstaston)	2·46	— ·59	·65	26	18	56·0	5	30·0	24
,,		Worcester (Diglis Lock)	2·56	+ ·58	·60	26	18	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	...	...	...	..	...	...	...	...	...
,,		Boston	1·69	— ·16	·51	9	10	62·0	11	27·0	23
,,		Hesley Hall [Tickhill].....	1·45	— ·53	·42	26	10	57·0	5	25·0	31
VIII.		Manchester(PlymouthGrove)	3·27	— ·17	·90	27	21	58·0	27	30·0	23
IX.		Wetherby (Ribston Hall) ..	2·63	+ ·19	·65	29	14	...	...	...	...
,,		Skipton (Arncliffe)	8·92	+ 2·11	1·16	26	27	...	...	...	...
,,		Hull (Pearson Park).	2·20	— ·07	·40	26	14	58·0	5, 6	26·0	31
X.		Newcastle (Town Moor)	1·09	— 1·21	·45	29	14	...	...	...	...
,,		Borrowdale (Seathwaite).....	23·72	+ 8·91	2·51	9	27	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	5·40	+ ·85	1·24	6	22	...	...	...	...
,,		Haverfordwest	5·74	+ ·75	1·53	26	24	56·0	6	33·1	30
,,		Aberystwith (Gogerddan) ...	7·43	+ 2·55	2·75	26	21	54·0	5	...	...
,,		Llandudno.....	2·90	— ·06	·86	26	23	61·0	5	34·0	30
XII.	SCOTLAND.	Cargen [Dumfries]	8·00	+ 3·98	1·12	26	22	56·0	11	24·0	31
XIII.		Edinburgh (Blacket Place)...	1·91	...	·29	5	19	57·5	5	26·0	31
XIV.		Colmonell	4·52	...	·62	27	28	57·0	5	24·0	29
XV.		Tighnabruaich	8·78	...	·98	4	28	50·0	4*b*	28·0	29
,,		Mull (Quinish).....	9·64	+ 2·07	1·26	4	30	...	...	...	...
XVI.		Loch Leven Sluices	4·40	+ 1·09	1·00	4	14	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·35	— ·73	·20	3*a*	19	57·5	5	24·5	31
XVII.		Braemar	5·22	+ 2·75	1·37	27	25	52·1	5	16·0	31
,,		Aberdeen (Cranford)	2·18	...	·38	31	27	57·0	4	21·0	30
,,		Cawdor (Budgate)	4·32	+ 1·86	·66	4	27	...	...	...	...
XVIII		Strathconan [Beauly]	9·44	+ 3·67	1·04	10	17	...	...	...	...
,,		Glencarron Lodge.....	21·65	...	1·76	1	28	53·4	26	25·7	30
XIX.		Dunrobin	6·24	+ 2·87	·69	17	23	56·0	12	29·0	29
,,		S. Ronaldshay (Roeberry) ...	5·92	+ 2·26	·71	1	29	52·0	11	30·0	29
XX.	IRELAND.	Darrynane Abbey.....	3·95	...	·58	28	26	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·01	— ·63	1·02	26	19	56·0	2	23·0	20
,,		O'Briensbridge (Ross)	4·06	...	·41	26	24	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·00	— 1·12	·74	26	21	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·07	— 1·09	·26	26	21	58·8	5	32·1	20
XXII.		Ballinasloe	3·22	— ·20	·42	26	28	54·0	5, 25	31·0	20
,,		Clifden (Kylemore)	12·44	...	2·97	22	30	...	...	...	...
XXIII		Waringstown	2·69	— ·35	·46	28	20	55·0	11	45·0	10
,,		Londonderry (Creggan Res.).	4·54	+ ·33	·87	4	27	...	...	...	...
,,		Omagh (Edenfel)	3·90	+ ·22	·37	28	25	55·0	4, 5	27·0	29

+ Shows that the fall was above the average ; — that it was below it.

a—and 5, 26. *b*—and 5, 10, 11, 12. *c*—and 31.

METEOROLOGICAL NOTES ON DECEMBER, 1898.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Remarkably warm for the first 19 days, then a few sharp frosts before Christmas; dry from 10th to 26th. Mean temp. 45°·0, and only one day with the max. below 40°. Gales on 27th and 29th. Duration of sunshine 50 hours 40 mins.

HARTLEY WINTNEY.—The early part of the month was mild and wet, and though no R fell from 17th to 26th, the total is ·12 in. above the average. S.W. winds were prevalent, and a S.W. gale occurred on 27th. Ozone was registered on 11 days. Robins' and wrens' nests with eggs were found on 17th. Christmas rose, violets and wallflowers were in bloom on 18th.

WINSLOW, ADDINGTON.—A mild month, the only cold period being from the 20th to the 24th, when the day temp. was low, but the min. did not fall below 26°. On 18 days the max. ranged from 50° to 56°. The wind was very high on the 2nd, 5th and 27th.

WESTLEY, BURY ST. EDMUNDS.—The first three weeks were mild, followed by six frosty days. Violent gales occurred in the last week.

NORWICH, BRUNDALL.—Extraordinarily mild, the mean temp. of the first 18 days being as high as 47°·5; while on the 5th the max. was 55°·6 and the min. 53°·6; on 6th, max. 55°·2 and min. 52°·4; and on 18th, max. 56°·0 and min. 50°·4. Gales from S.W. on 2nd and 27th. Distant L in N.E. on evening of 7th, L in N. on evening of 28th. H on 20th.

WINTERBOURNE STEEPLETON.—The month was wet and mild, the nights being especially warm. The mean minima in shade and on grass were 40°·4 and 34°·1 respectively, or 5°·1 and 5°·0 above their averages. Fog on 17th and 21st. H on 27th.

TORQUAY, CARY GREEN.—R ·15 in. above the average. Mean temp. 48°·8, or 5°·8 above the average. Duration of sunshine 59 hours 5 mins., being 4 hours 20 mins. above the average; 9 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The whole month was very wet and the first half stormy, but the temp. was high. S.W. gale at night on 26th and early on 27th. H on 7th, 28th and 31st. T at 6 a.m. on 9th.

WOOLSTASTON.—A mild, warm month, the night temperatures for the first 18 days being unusually high. A wild gale raged on 26th, and the remainder of the month was stormy. Mean temp. 44°·3.

WALES.

HAVERFORDWEST.—Extremely mild and wet, with very little sunshine, and only one day of clear sky. Up to the 18th the weather was almost continuously wet, with but one slight frost; from 19th to 23rd, colder and drier weather prevailed, but afterwards every day was wet to the end. Very high temp. prevailed throughout, and the minima on grass on 25th and 26th were 51°·6 and 52°·2 respectively, while the lowest grass min. was 25°·0 on 31st. Gales on 10 days. Spring flowers in bloom, and fruit trees budding.

GOGERDDAN.—Very wet and very mild throughout.

SCOTLAND.

CARGEN [DUMFRIES].—Stormy, wet, unsettled weather characterised the month. The mean temp., 44°·5, is 5°·9 above the average, and the highest recorded in December since observations commenced in 1860, the nearest approach being 43°·9 in 1873. Frost was registered on only 4 days, and the temp. rose above 50° on 17 days. Only in 1872, 1876 and 1897 did the fall of R exceed that of December, 1898. Southerly winds were most prevalent; a severe gale blew on 5th, and stiff breezes on 3rd and 4th. The duration of sunshine, although exceeding the average of the last 3 years by 12 hours, is 8 hours less than the December mean. Pastures present quite a spring-like appearance, and snowdrops were in bloom at the end of the month.

EDINBURGH, BLACKET PLACE.—Very mild, the mean temp. (44°·0) being 5°·7 above the average. The only milder Decembers since 1764 were those of 1842, 1843 and 1857, with mean temps. of 45°·6, 47°·8 and 46°·5 respectively. Duration of sunshine only one-fifth of the average; but rainfall slightly below the mean. The max. temp. on 5th, 57°·5, is the highest recorded in December since 1864, while the mean temp. of the day, 54°·0, is higher than any recorded in December, January or February for at least 42 years. A very heavy W.S.W. gale occurred on 27th, and a little S and sleet fell on 31st.

COLMONELL.—R ·64 in. below, and mean temp. 8°·0 above, the average of 22 years, the mean temp. being the highest recorded in that period.

TIGHNABRUAICH.—The R was most persistent and excessive, and accompanied by high winds from all points of the compass.

MULL, QUINISH.—A very wet and stormy month from first to last, with gales from all points of the compass. T and L on 26th and 27th.

ABERDEEN, CRANFORD.—The month was very mild, with a strong S.W. gale on 27th.

S. RONALDSHAY, ROEBERRY.—A very rough, wet month. Mean temp. 41°·7, being 1°·9 above the average of 8 years.

IRELAND.

DARRYNANE ABBEY.—A dry and remarkably mild month, most of the R which fell being mere drizzle. Very strong W.N.W. gale on 27th. H on 31st.

WATERFORD, BROOK LODGE.—The month was very mild. Several unusual plants were in bloom in the garden, and the fences golden with furze bloom. W.S.W. gale on 4th, and gale from W. with H on 27th. Fog on 17th.

DUBLIN, FITZWILLIAM SQUARE.—The warmest December on record for many decades, the mean temp. being 6°·3 above the average. There was scarcely a trace of frost, S, sleet and H were entirely absent and S.W. or W. winds prevailed throughout. The R was not half the average, while the number of rainy days much exceeded it. Lunar halo on 28th. High winds on 22 days, reaching the force of a gale on 5. Fog on 3 days.

CLIFDEN, KYLEMORE HOUSE.—T and L on 3rd. Great R on 22nd, causing floods on that and the two following days. In the last ten days of the month 8·44 in. of R fell.

OMAGH, EDENFEL.—Although the temp. fell to or below freezing-point on 9 nights, the cold was of the most fleeting kind, and hardly affected the continued mild character of the month and the season generally. R was frequent and heavy, accompanied mostly by strong winds, reaching the force of a gale on 27th, occasioning considerable damage over a wide area.

END OF VOL. XXXIII.

SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

VOLUME THE THIRTY-FOURTH.

1899.

LONDON:
EDWARD STANFORD, COCKSPUR STREET, S.W.
1900.

THE NEW YORK
PUBLIC LIBRARY
CANCELLED
ASTOR, LENOX AND
TILDEN FOUNDATIONS.
R 1900. L

INDEX.

PAGE

Anticyclones and Frost 6
August and September, 1899, Heavy Rainfalls 149
August 15th, Thunderstorm on..... 122
Barometer, Low, on Dec. 29th, 1899 177
Black Rain..... 73
Book of Knowledge, The 8
Botany and Meteorology..... 55
British Association at Dover, The... 145
British Mountain Tops, Winter Minima on 33, 53
Camden Square, Meteorological Observations at, for 40 years, 1858-1897...1, 27, 44, 59, 75, 91, 107, 123, 139, 155, 171, 183
Cape Town, Flood in 152
Cheltenham, A hot morning in 102
Climatological Table for the British Empire, 1897..... 3
Climatological Tables for the British Empire...12, 28, 43, 60, 76, 92, 108, 124, 140, 156, 172, 184
Compass Plant, A..... 114, 151
December, 1899, Severe frost in .. 181
December 29th, 1899, Low barometer on..... 177
Dover, The British Association at . 145
Drought, Definition of..... 97, 151
Dryness at Parkstone, Dorset 103
Electric Snow 113
Errata in Meteorological Mag., 1898 102
Extremes of Temperature in London for 104 years 17
February, 1899, Frost in the United States in..... 65
Flood in Cape Town..... 152
Floods in January, 1899 ..... 5, 18
Fog, Effects of 166
Frost and Anticyclones 6
Frost in December, 1899, Severe ... 181
Frost in the United States in February, 1899, Unprecedented 65
Godfridus. The Book of Knowledge 8
Halo, Lunar 88
Hellmann, Dr., Rainfall Map of Silesia 23, 39
Hot morning in Cheltenham, A..... 102
January, 1899, Floods in..... 5, 18

PAGE

July 22nd and 23rd, The Thunderstorms of 101
Kites and Meteorology 169, 180
Klondike, Weather at..... 52
Lightning at Dinner..... 165
London, Extremes of temperature in, for 104 years 17
Lunar Halo, A 88
Lunar or 30-day period in Weather 20, 68, 86, 104, 117, 135, 154
March 20th, 1899. Whirlwind at Worstead, Norfolk 51, 74
Meteorite, A monster 55
Meteorological Extremes.....81, 129, 149
Meteorological Notes at Tai-Yüen-Fu, Shansi, North China 138
Meteorological Notes on the Months 15, 31, 47, 63, 79, 95, 111, 127, 143, 159, 175, 187
Meteorological Observations at Camden Square, London, for 40 years, 1858-1897...1, 27, 44, 59, 75, 91, 107, 123, 139, 155, 171, 183
Meteorological Society, The Royal 7, 19, 38, 57, 89, 169, 178
Meteorology and Botany 55
Meteorology, Kites and 169, 180
Meteorology, The Aims of 161
Minima on British Mountain Tops 33, 53
Moon and the Weather, The 20, 68, 86, 104, 117, 135, 154
Mountain Tops, Winter Minima on 33, 53
November, 1899, A wet period in October and 153
OBITUARY :—
Charles Leeson Prince..... 49
Mariano de la Bárcena..... 49
October and November, 1899, A Wet Period 153
October 1st, Heavy Rainfall on..... 144
Ozone 50, 74, 90
Parkstone, Dorset, Dryness at 103
Persian Rainfall 116
Post Office in 1876 and in 1898, The 41
Pressure, Extremes of..... 81
Radiation, Excessive Terrestrial ... 54
Rain, Black 73
Rainbow Wonders of Windermere 114

PAGE

Rainfall, Heavy August and September, 1899 149
Rainfall of Silesia, Dr. Hellmann 23, 39
Rainfall on October 1st, Heavy..... 144
Rainfall and Temperature, Monthly 14, 30, 46, 62, 78, 94, 110, 126, 142, 158, 174, 186
Rainfall, Persian 116
Rain Gauge, Negretti and Zambra's Self-Recording 36

REVIEWS :—

Traité élémentaire de Météorologie, par Alfred Angot..... 9
Seismology, by John Milne, F.R.S. F.G.S., &c. 11
Regen-Karte der Provinz Schlesien, von Prof. Dr. Hellmann...23, 39
Annuario storico meteorologico Italiano redatto dal P. Guiseppe Boffito dell' Osservatorio di Moncalieri. Volume I. 1898... 24
Cloud Observations in Victoria, by P. Baracchi, F.R.A.S. 24
Annales de l'Observatoire Météorologique du Mont Blanc, par J. Vallot. Tome III..... 25
Climate of Cuba, also a note on the weather of Manila, by W. F. R. Phillips 26
Les bases de la Météorologie dynamique, Historique, État de nos connaissances, par M. le Prof. Dr. H. H. Hildebrandsson et M. Leon Teisserenc de Bort..... 56
The Hereford Earthquake of December 17th, 1896, by Charles Davison, Sc.D., F.G.S. 70
Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus, herausgegeben von Prof. Dr. G. Hellmann. No. 12. Wetterprognosen u Wetterberichte des XV. und XVI. Jahrhunderts.. 72
Quelques Recherches sur les centres d'action de l'atmosphère. II., La Pluie, par H. Hildebrand Hildebrandsson ... 106
Lightning and the Electricity of the Air, by Alexander G. McAdie and Alfred J. Henry 118
Nedboriagttagelser i Norge udgivet af det Norske Metëorologiske institut. Aargang I., II. og III..... 119
Meteorologiske Middeltal og Extremer for Faroerne, Island og Gronland 120

PAGE

The Altitude of the Aurora above the Earth's Surface, by Prof. Cleveland Abbe..... 167
Meteorological Observations taken at Kenilworth, Kimberley, during the year 1898, by J. R. Sutton, B.A..... 167
Sur les ascensions dans l'atmosphère d'enregistreurs météorologiques portés par des cerfs-volants 180
Sur la température et ses variations dans l'atmosphère libre, d'aprés les observations de quatre-vingt-dix ballons-sondes. Par M. L. Teisserenc de Bort... 180
September, 1899, Heavy Rainfall in August and 149
Silesia, Dr. Hellmann's Rainfall Map of 23, 39
Smoke Fog and Maximum Temperature 149
Snow Crystals, Unusual 168
Snow, Electric 113
Supplementary Tables of Rainfall 13, 29, 45, 61, 77, 93, 109, 125, 141, 157, 173, 185
Tai-Yüen-Fu, Meteorological Notes at..... 138
Temperature, Effect of the Moon on 20, 68, 86, 104, 117, 135, 154
Temperature Extremes 129, 149
Temperature, Extremes of, in London for 104 Years..... 17
Temperature, Maximum, and Smoke Fog 149
Temperature, Reversal 8
Temperature, Trees and Change of 114, 137
Terrestrial Radiation, Excessive ... 54
Thunderbolt, Wonderful Story of a 150, 170
Thunderstorms of July 22nd–23rd 101
Thunderstorm on August 15th 122
Trees and Change of Temperature 114, 137
United States, Unprecedented Frost in the, in February, 1899 65
Weather at Klondike 52
Weather, The Moon and the 20, 68, 86, 104, 117, 135, 154
Wet Period, A, October and November, 1899..... 153
Whirlwind at Worstead, Norfolk, March 20th, 1899..... 51, 74
Will-wi'-the-Wisp 21
Windermere, Rainbow Wonders of 114
Winter Minima on British Mountain Tops..... 33, 53
Worstead, Norfolk, Whirlwind at 51, 74

No. CCCXCVII.] [PRICE FOURPENCE.
VOL. XXXIV. *Or 5s. per annum post free.*

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

...OOKS
...LIBRARY
...CEDOR AND
...CORNATIONS

CONTENTS.

	PAGE.
Meteorological Observations at Camden Square, London, N.W. ...	1
Climatological Records for the British Empire in 1897	3
Floods in January, 1899	5
Frost and Anticyclones	6
Royal Meteorological Society	7
Temperature Reversal	8
Godfridus—The Book of Knowledge	8
REVIEW :—	
Traité élémentaire de Météorologie, par Dr. ANGOT ...	9
Seismology, by Prof. MILNE	11
Climatological Table for the British Empire, August, 1898 ...	12
Supplementary Table of Rainfall, January, 1899	13
Rainfall and Temperature in January, 1899, at 50 Stations ...	14
Meteorological Notes on January, 1899	15

FEBRUARY, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Ro
Meteorological Societies, and of the British Astronomical Association; Arti
by various eminent Astronomers, English, American, and Continent
Correspondence on topics of interest connected with the Science; Notice
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assista
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu
publication.—*Prof. Young*, in "*Ten Years' progress in Astronomy.*"

*All communications should be addressed to the Editors of "The Observato
Royal Observatory, Greenwich, S.E.*

Annual Subscription (for the "Companion" and twelve Monthly Numbers),

NOTICES.

It is requested that all Books for Review, and Communications
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in
letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCVII.] FEBRUARY, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

THE ASTOR PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE, LONDON, N.W.

WE pointed out last year that only some features of the above record could be dealt with in the single page devoted to each month; but (as we were not sure that we could carry it out) we did not refer to that which we have now arranged to do—namely, to give a second series of tables entirely different from the others, but which had to be prepared before the others could be drawn up.

The head lines of the following table are, we think, sufficiently explicit, but they have had to be stated so briefly that perhaps some persons would like them amplified a little. Of course, the arrangement and definitions will be identical in each of the twelve months.

RAINFALL.—1, Total depth; 2, Total number of days with ·01 in.; 3, Maximum fall in any one day (the *date* had to be omitted for want of room); 4, Number of instances of a fall of 1 inch or more.

TEMPERATURE.—5, Mean of all the dry bulb temperatures at 9 a.m. and at 9 p.m.; 6, Similar means for the wet bulb temperatures; 7, Absolute, and 8, Average, max. temp. in shade; 9, Absolute, and 10, Average, min. temp. in shade; 11, 12, 13, 14, need no comment; 15 is the mean of observations at 9 a.m. and at 9 p.m.

Many persons will miss a column giving mean temperature; they are referred to the note on p. 3 of our last volume, and they will find that by using the figures given in columns 5, 8 and 10, they can compute it in any or all of the different ways there shown.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

JANUARY.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry Mean, 9a.&9p.	Wet Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	·88	6	·48	0	37·0	35·6	52·2	43·8	23·1	30·8	..	..	..	..	4·8
1859..	·72	10	·20	0	40·1	38·8	52·6	44·8	27·0	34·2	..	..	..	..	6·2
1860..	1·97	21	·34	0	39·8	38·4	54·8	44·7	27·2	35·0	..	..	26·3	34·6	5·8
1861..	·43	7	·18	0	33·2	32·4	52·4	38·4	14·3	28·9	..	..	8·5	26·3	6·5
1862..	1·92	19	·38	0	39·2	37·7	55·3	43·5	18·1	33·7	..	..	13·3	30·0	7·3
1863..	2·80	15	·66	0	41·9	40·4	53·7	46·2	26·7	37·6	..	..	19·8	34·5	7·1
1864..	1·02	8	·32	0	36·5	35·7	53·8	41·0	15·1	32·5	..	..	8·8	28·3	7·1
1865..	3·90	13	1·12	1	36·4	35·3	50·8	40·9	18·0	31·5	..	..	14·3	28·8	7·0
1866..	3·90	23	1·20	1	42·5	40·7	54·2	47·6	22·7	38·3	..	..	9·3	34·1	5·5
1867..	2·81	17	·51	0	34·7	32·4	56·0	39·7	6·7	29·3	..	..	0·5	25·8	6·3
1868..	3·89	19	·79	0	38·1	36·9	53·0	41·5	23·4	33·0	..	..	20·5	30·9	8·2
1869..	2·76	15	·58	0	41·7	40·6	56·3	46·3	25·0	35·9	..	..	22·0	32·5	7·7
1870..	1·38	17	·24	0	38·3	37·3	51·7	43·4	21·2	34·4	77·4	56·0	17·9	30·7	5·9
1871..	1·99	17	·42	0	33·8	33·1	45·2	37·4	19·7	29·5	71·1	48·6	20·8	27·4	8·4
1872..	3·46	22	·47	0	41·4	40·1	52·8	46·1	27·4	36·3	77·3	58·9	24·6	32·9	6·1
1873..	2·44	18	·44	0	42·1	40·4	53·9	46·7	28·4	38·3	76·9	61·5	23·6	35·0	6·7
1874..	1·18	17	·33	0	41·7	40·5	55·4	47·4	28·0	35·9	85·6	61·6	24·6	33·7	6·3
1875..	3·22	23	·42	0	43·7	42·8	53·8	48·2	20·7	39·2	83·2	60·8	20·6	36·4	7·1
1876..	·94	11	·32	0	37·1	36·2	54·8	42·5	18·9	31·5	85·3	53·5	17·8	29·6	7·2
1877..	4·74	25	·60	0	42·7	41·3	56·4	48·5	28·5	37·4	87·3	61·8	25·4	34·3	7·1
1878..	1·31	15	·30	0	40·0	38·7	55·6	45·2	26·9	35·5	76·6	59·9	21·6	32·1	7·1
1879..	2·87	12	1·12	1	31·8	31·1	51·0	35·8	19·2	28·7	63·5	44·1	18·3	26·9	7·2
1880..	·31	5	·19	0	33·0	32·3	55·4	37·7	19·2	29·5	73·0	48·7	13·7	26·4	6·8
1881..	1·85	8	1·08	1	31·2	30·6	48·4	36·7	11·8	26·1	79·8	50·0	0·6	21·9	7·2
1882..	1·30	7	·56	0	40·5	39·5	53·4	45·4	27·4	36·1	74·4	51·4	21·3	31·8	7·9
1883..	2·08	21	·34	0	41·1	39·7	55·3	46·3	28·8	36·9	73·9	55·7	24·5	33·1	7·5
1884..	2·30	16	·55	0	43·8	42·2	55·6	48·8	32·2	39·2	72·8	57·1	28·6	35·6	7·2
1885..	1·43	16	·31	0	36·9	35·7	53·3	41·0	22·8	32·2	67·1	45·6	16·8	28·4	8·1
1886..	4·02	23	·52	0	35·9	34·8	51·3	41·4	20·8	31·6	67·6	53·6	8·3	26·7	6·5
1887..	1·26	13	·34	0	36·0	35·3	52·2	40·3	14·5	30·6	68·3	46·4	11·0	27·7	7·4
1888..	·90	9	·24	0	37·5	36·6	51·8	42·7	23·1	33·2	78·3	52·3	19·0	29·2	7·1
1889..	·81	10	·19	0	37·3	36·3	53·1	41·8	22·0	32·4	76·8	49·6	16·4	28·1	7·3
1890..	2·46	21	·35	0	43·2	41·7	55·6	48·9	26·1	37·9	83·1	61·7	18·3	33·5	7·4
1891..	1·80	14	·35	0	34·0	33·1	53·0	39·4	16·9	28·9	78·2	52·8	12·5	24·9	6·6
1892..	·50	13	·13	0	36·3	35·3	52·0	41·5	22·8	30·9	78·9	51·8	15·8	26·6	6·3
1893..	1·44	17	·26	0	35·7	34·7	52·7	40·0	15·4	30·9	69·1	50·3	10·0	26·6	7·3
1394..	2·87	25	·34	0	38·2	36·9	52·0	43·2	13·1	32·6	76·8	56·1	14·3	29·0	7·2
1895..	1·96	16	·75	0	33·3	32·4	51·9	38·1	17·2	29·1	69·1	51·0	16·2	27·0	6·5
1896..	·78	9	·22	0	40·3	39·1	52·7	45·4	28·0	36·5	72·6	53·1	24·3	33·2	8·0
1897..	2·05	20	·83	0	35·1	34·5	47·0	39·8	23·4	31·7	69·0	50·6	16·6	28·2	7·3
Mean ...	2·02	15	·47	0·1	38·1	36·9	53·1	43·0	21·8	33·3	75·5	53·7	17·0	30·1	7·0
Extremes	4·74	25	1·20	1	43·8	42·8	56·4	48·9	32·2	39·2	87·3	61·8	28·6	36·4	8·4
	·31	5	·13	0	31·2	30·6	45·2	35·8	6·7	26·1	63·5	44·1	0·5	21·9	4·8

CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE IN 1897.

The Annual Summary of the Climatological Returns for 1897, which should have appeared in September, 1898, has been crowded out by other matter which called for prompt publication.

It would be far too large a task to attempt to express an opinion as to the meteorology of the year in the individual colonies, but a comparison of the Summary of Extremes with the similar data for previous years reveals little that calls for special remark. Most of the extremes have occurred at the same stations in other years, and appear to be thoroughly normal. The chief exceptions are, the highest mean temp. and the least amount of cloud. The former, 82°·2 at Colombo, has not been exceeded in our tables since 1876, when the mean temp. at Madras was 83°·2, while the highest previous value for Colombo is 81°·9 in 1880. The latter, 2·5 at Grenada, is unprecedented in the 21 years; the nearest approach to it being 2·9 at Malta in 1885.

Grenada comes to the front, as it did last year, with four extremes —least total range, least mean daily range, greatest rainfall and least amount of cloud. The amount of cloud we have referred to above, but the three other values are far from remarkable. The returns from Trinidad are unfortunately not complete for the year, but in May a max. temp. in sun of 173°·0 was recorded, a higher reading than that quoted for Adelaide in the table.

SUMMARY.

Highest temp. in shade ...	110°·8 at Adelaide on Dec. 16th & 28th
Lowest „ „ ...	—41°·0 at Winnipeg on Feb. 25th.
Greatest range in year ...	133°·7 at Winnipeg.
Least „ „ ...	20°·6 at Grenada.
Greatest mean daily range...	23°·6 at Winnipeg.
Least „ „ „ ...	9°·7 at Grenada.
Highest mean temp. ...	82°·2 at Colombo, Ceylon.
Lowest „ „ ...	34°·7 at Winnipeg.
Driest station	Adelaide, mean humidity 59.
Dampest „	Esquimalt, „ „ 86.
Highest temp. in sun ...	166°·3 at Adelaide.
Lowest temp. on grass ...	—11°·0 at Toronto.
Greatest rainfall	83·64 in. at Grenada.
Least „	14·22 in. at Malta.
Most cloudy station ...	Esquimalt, average amount 6·7.
Least „ „ ...	Grenada, average amount 2·5.

The min. on grass is not recorded at the other Canadian stations.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1897.

Stations. *Those in Italics are South of the Equator.*	Absolute.				Average.					Absolute.		Total Rain.		Average.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.										
	°		°		°	°	°	°		°	°	in.		0—10
England, London ...	88·4	August 5	23·4	January 18	58·3	43·7	51·0	48·2	80	132·6	16·6	22·86	164	6·4
Malta	97·8	September 14	39·4	January 31	71·8	59·1	65·5	55·6	75	159·7	32·3	14·22	81	4·3
Cape Town.....	97·4	March 3	35·7	July 5	70·8	53·8	62·3	52·8	77	...	...	20·17	86	4·6
Mauritius	88·0	January 18	57·4	May 21	80·4	69·2	74·8	64·6	74	135·7	49·1	27·26	168	6·0
Calcutta	104·6	May 9	49·0	January 19 / Dec. 17	86·7	71·3	79·0	68·3	72	161·7	39·2	58·33	91	4·6
Bombay	93·7	June 5	61·1	January 20	85·9	74·6	80·2	71·6	75	150·6	51·2	81·53	108	3·8
Ceylon, Colombo ...	93·2	March 2	68·0	January 13	88·0	76·4	82·2	73·6	80	153·0	65·0	82·73	211	5·7
Melbourne	107·3	December 30	31·5	June 13	67·0	49·1	58·1	47·6	70	157·9	20·9	25·85	117	5·6
Adelaide.....	110·8	Dec. 16 & 28	37·7	August 23	73·0	53·7	63·4	47·5	59	166·3	28·1	15·42	119	4·9
Wellington	81·0	January 12	31·0	July 20	61·7	49·4	55·6	46·2	71	145·0	21·0	48·51	176	4·4
Jamaica, Kingston..	94·0	August 8	62·0	January 12	87·8	71·7	79·7	69·1	73	...	...	42·93	78	3·8
Grenada	89·8	March 28	69·2	December 4	83·8	74·1	79·0	71·8	76	157·4	..	83·64	236	2·5
Toronto	93·3	July 5	— 7·2	January 25	53·9	37·6	45·7	39·4	76	110·0	—11·0	32·50	146	6·2
New Brunswick, Fredericton.....	92·7	July 8	—18·4	February 28	50·9	29·9	40·4	32·4	67	...	...	39·12	135	5·5
Manitoba Winnipeg	92·7	September 8	—41·0	February 25	46·5	22·9	34·7	..	...	...	...	17·59	111	5·2
British Columbia, Esquimalt	85·5	August 3	22·2	January 27	55·4	42·0	48·7	44·0	86	...	...	39·20	170	6·7

FLOODS IN JANUARY, 1899.

DECEMBER, 1898, was rather wet in the west of England, and in Wales, with considerable falls of rain in the last week. January also was wet in the same districts; very wet at some of them, *e.g.*—it is stated that on the south side of the Brecknock Beacons the fall during December and up to January 24th, was not far short of *thirty inches*. It is, therefore, natural that there should have been considerable floods. We are not now going to give a complete account of them, but on the other hand it would not be desirable to let them pass without such comment as is at present possible.

In the THAMES the flooding seems to have been much less than on many recent occasions. A few houses were invaded at ETON, WINDSOR, and EGHAM, and boats went where carriages should have gone, but owing either to less rain, or to better river administration, the records indicate little damage compared with previous years. It is in Divisions VI. and XI. that the floods were most serious, and perhaps most so at HEREFORD. Unlike York (which, after letting its archives be damaged by a flood, erected a first-class recorder of the level of the Ouse), HEREFORD has often suffered by flood, but has kept only a miserably incomplete record of the flood of the Wye, and has waited until London proposes to take some of its flood waters, and now, at the 11¾th hour, it *proposes* to begin a proper record. This, however, is by the way; but we fear that the lesson will not be taken to heart by any other city—each *will* buy its own experience.

To resume. We have not seen the scale of heights on the Wye bridge at HEREFORD, but as far as we can make out from the *Hereford Times* there is one on one of the piers, but, owing to the slope of the stream, the water on the scale stands at 16 ft. above datum, when the real level of the river is about 17 ft. above datum. But the writers upon the subject have confused it by (apparently) applying this correction to the present flood, but not to previous ones.

We infer that the facts for HEREFORD are approximately—

		ft.	in.
Absolutely highest flood on record,	Feb. 11th, 1795	20	0
Subsequent floods.....	Feb. 6th, 1852	18	4
	Nov. 15th, 1894	16	9
	Jan. 22nd, 1899	17	3

Another statement gives 1899 as exactly 3 ft. below 1795. Therefore the recent flood has been exceeded only once in a century, and then only by about 1 foot.

The city engineer of Hereford should do as his brother officer at York has done: hunt up all trustworthy records, reduce them to Ordnance Datum, and, in one or more places in the city, erect cast iron plates with the levels marked upon them from 1795 downwards.

For Ross a list of flood levels was given by Mr. H. Southall, F.R.Met.Soc., in the *Quar. Jour. R. Met. Soc.* Vol. XXI. p. 38, from which we select the following, making, upon Mr. Southall's authority, two small corrections, and adding the recent flood :—

		ft.	in.
Absolutely highest flood on record,	Feb. 12th, 1795	17	9
Subsequent floods.....	Jan. 27th, 1809	17	3
	Nov. 24th, 1824	17	3
	Feb. 10th, 1831	17	3
	Feb. 8th, 1852	16	10
	Nov. 12th, ,, ...	16	5
	Nov. 15th, 1894	14	5
	Jan. 23rd, 1899	14	7

At Bridgnorth the flood is said to have been exceeded as recently as 1886.

For Shrewsbury no heights are given, merely the statement that the height had not been equalled since 1869.

For Worcester details are given by Messrs. Marriott and Gaster (*Quar. Jour. R. Met. Soc.* Vol. XII. p. 280), whence we get—

		ft.	in.
Absolutely highest flood on record,	Nov. 18th, 1770	17	7
Subsequent floods.....	Feb. 11th, 1795	16	11
	May 15th, 1886	17	1
	Nov. 16th, 1894	12	10
	Jan. 23rd, 1899	14	0

At York the automatic recorder showed that the flood rose to 12 ft. 10 in., being the highest since the apparatus was erected after the great flood of 1892.

At Monmouth the floods are said to have been higher than since 1852, but no measures are given.

At Abergavenny also no heights are given, merely the statement that they were higher than in 1894.

At Rhyl there is only the vague statement that "they have not been equalled since 1879."

FROST AND ANTICYCLONES.

In our last number, on page 179, we mentioned the paper upon the above subject which was read before the Roy. Met. Soc., on Dec. 21st, by Mr. W. H. Dines.

Our attention has since been called to the fact that the subject had been considered in the early part of 1895 by M. A. Lancaster in his paper, *Sur la période de froid du 27 Janvier au 17 Février*, 1895, published in the *Bulletins de l'Académie royale de Belgique*.

As the paper is not accessible to all our readers, we give a free translation of the concluding paragraph and the (rather long) footnote to it, converting the measures into English units :—

"It is, then, an error to consider, as is frequently done, that the

severity of a winter is in distinct relation to the height of the barometer during it.* The error is especially obvious when it refers to December, in which we often have high pressures with mild misty weather. Then it is that we have fogs lasting sometimes a fortnight, and gradually changing to a drizzling rain."

We see that there is a note upon the subject by M. Lancaster in the last number of *Ciel et Terre*.

ROYAL METEOROLOGICAL SOCIETY.

THE Annual Meeting of this Society was held on January 18th, at the Institution of Civil Engineers, Great George Street, Westminster; Mr. F. Campbell Bayard, LL.M., President, in the chair.

The Council, in their Report, stated that, owing to the premises now occupied by the Society, at 22, Great George Street, being required by the Government, they had been obliged to seek accommodation elsewhere; but not being able to secure offices in the immediate neighbourhood, they had taken a suite of rooms at 70, Victoria Street.

GOVERNMENT METEOROLOGICAL ORGANIZATIONS.

Mr. Bayard, in his presidential address, gave an account of the Government meteorological organisations in various parts of the world. He first briefly described the founding of each system, and mentioned the names of the various directors, and then stated the number of observing stations associated with each organisation. In most countries forecasts of the weather are issued, and Mr. Bayard gave some interesting particulars as to the success attained by each office. The amount of money voted by the various Governments for the support of meteorology showed what a very small portion of the revenue of the different countries goes towards the promotion of this science. In the British Isles it is only about one-third of a farthing per head of the population.

The address was illustrated by a large number of lantern photographs of the various observatories and portraits of the directors.

Mr. Bayard was re-elected President for the ensuing year.

"* If we examine the table of monthly mean pressure at Brussels from 1833 to 1895, we find that for December the 7 highest had a mean of 766 mm. (30·158 in.) at 57 m. (187 ft.); that of them only 1 had a temperature below the mean, the other 6 were all above it—on the average 1°·2 C. (2°·2 F.)

"For February, the 7 with the highest barometric pressure averaged 765·4 mm. (30·134 in.); of these, also, only 1 was colder than the mean, 1887, by 1°·1 C. (2°·0 F.), and the other 6 were all above it by, on the average, the same amount, 1°·1 C.

"Finally, the 8 months of January with the highest mean pressures, about 765 mm. (30·118 in.), have had temperatures below the mean by 1°·2 C. (2°·2 F.); but this is little compared with what we observe when with a lower barometer our country is under the influence of an anticyclone. Thus, the 11 coldest Januaries, with an average temperature of 4° C. (7°·2 F.) below the mean, have had as their mean barometric height 758 mm. (29·843 in.)

TEMPERATURE REVERSAL.

To the Editor of the Meteorological Magazine.

SIR,—One morning in January about 14 years ago we woke up surrounded by a white world, with about an inch of snow; but the curious thing was, that the higher you looked up the hills the less snow there was. At 1,200 ft. high there was practically no snow, and none above this limit; the Clees, reaching 1,800 ft., were quite green above about 1,000 ft. They must have had the storm, because the tops of the hills to our west, 1,200 ft. high, had just a trace of snow, while the Clees, being to the N.E. and much higher, the phenomenon was more marked on them. At Church Stretton, 16 miles N.N.W., the case was similar—the valleys were white, while the hills on each side, rising to 1,500 and 1,600 ft., were bare. At 11 a.m. there was a sharp snowstorm; when it reached the Clees it brought down a thick cloud, so I thought that surely they would be white when it lifted; but no, they were as green as before. About 4 p.m. the Clees had another storm of a more snowy character—they were white over in a minute or two, and thus the country regained a normal aspect. Up till 4 p.m. the sight was most peculiar; instead of snow-clad hills and green valleys, the case was reversed, and there were white valleys and green hills, and on every hill there was little or no snow over 1,000 ft.

The snow must have been *snow* on the hills, as it could not have formed between the height of the hills and the valleys; but somehow the air above 1,000 ft. must have been very much warmer, not only here but over at least half of Shropshire, as shown by the same state of things at Church Stretton. The wind was W. to W.N.W. There was a frost early, as far as I remember; but after 10 a.m. the temperature was slightly above 32°.

I trust that you will be able to give space in your Magazine for this, as it may elicit some useful remarks.—Yours very truly,

RICHD. P. DANSEY.

The Sheet, Ludlow, Oct. 26th, 1898.

GODFRIDUS—THE BOOK OF KNOWLEDGE.

[OUR suggested emendation of "grazing" for "gazing" does not seem acceptable. We at once withdraw it, as country observers are infinitely more likely to be right than we are; but if we might be permitted one remark it would be that, as cattle normally stand on the grass and graze on it, we think that that is grazing from below; but what was running in our mind was the idea that in bad weather cattle remained in the valleys, and therefore grazed from below—

i.e., not from the top of the hills. However, we do not know, and we thank our correspondents for helping us.—ED. *M.M.*]

"I should be rather disinclined to accept your conjectured emendation in the *Met. Mag.*, p. 181. Surely cattle when they bellow lift up their heads in a way that might well be described as 'gazing from below.' But although they graze below, I do not see that they graze *from* below."

REV. W. C. PLENDERLEATH, *Mamhead Rectory, Exeter.*

"In p. 181 of *Met. Mag.* you put a ? to 'gazing from below.' May I suggest whether it is not right? I have heard it said, 'It will be fine, the cattle are on the *tops* of the hills;' so, if wet, they would be down below—gazing from below.

"I merely throw out this suggestion.

"A shepherd tells me that rooks lighting on *dead wood*—*i.e.*, hurdles—are a sign of rain; also, thunderstorms come up *with* the wind before midsummer, and *against* it after midsummer."

REV. J. CROSS, *Bailie House, Wimborne.*

REVIEWS.

Traité élémentaire de Météorologie, par ALFRED ANGOT. Gauthier-Villars, Paris, 1899. Royal 8vo, vi.-418 pages, 4 plates and about 100 engravings.

WE think that Dr. Angot has been rather severe upon his own work in giving to it the designation "elementary," for it is much more than that—it is a thoroughly well-considered, well-written work. The author has wisely recognised that everything need not be put in every book, and has, therefore, left all who want to learn the manipulation of instruments to seek descriptions of them in the numerous "Instructions" which are accessible, and those who need statistics and tabular matter, to look for it in other works; and he has (inasmuch as this work is designed specially for tuition) given very little history. The almost complete exclusion of these three subjects has given him ample room to treat fully pressure, temperature, vapour, storms, halos, weather forecasting, &c.

The whole book is remarkably uniform in style and treatment. No one subject is unduly prominent or unduly neglected, but each is calmly considered and explained by reference to the physical laws which bear upon it.

It is not very often that Dr. Angot gives details of actual phenomena, but when he does the cases are usually very striking. Here is a specimen, he is speaking of *Verglas*, which in England we call a "silver thaw":—

"This phenomenon is sometimes intense, and prevails over a large area. Such was the case with the noteworthy *verglas* of January

22nd and 23rd, 1879, which covered nearly one-quarter of the surface of France—from Epernay to Nantes, and from Mézidon to Parthenay and Romorantin. At Vendôme the rain, at a temperature below 32°, lasted 30 hours, and amounted to 1·26 in., and formed, on flat or convex surfaces exposed to the free air, a coat of ice 0·98 in. thick. Exposed ropes were surrounded eccentrically by a layer of ice ¾-inch in diameter. Naturally, telegraph wires, twigs, branches and even entire trees, being incapable of bearing the weight of this mass of ice, were broken. At Fontainbleau the telegraph wires were surrounded by a coat of ice 1·49 in. in diameter; trees, with trunks 27½ inches in diameter, were broken, others were so bent over that their tops reached the ground."

We have noticed only two omissions. In diagram Fig. 75 the vertical circle through the sun is not shown. Engravings of portions of it are given in *Met. Mag.*, Vol. VI., p. 56 and 96; IX., p. 76, and an explanation is given by Mr. Cherrill in the second paragraph on p. 69 of Vol. XXVI. It is the simultaneous presence of this and of the parhelic circle (intersecting at an angle of 90° at the sun) which explains the records by old writers, and, even recently, one Good Friday, of "the sun in a perfect cross."

Ozone is another subject on which we have seen no remarks. We admit that this is on the debateable land between chemistry and meteorology; but chemists have no observations to make daily at a fixed hour, and it would therefore be much better left to the meteorologist to make the observations, if the chemist would but tell him exactly how, and what, to observe. It is a fact that country air after passing over a city is materially changed. We think that some method should be devised to show this; and while admitting the force of the criticisms which chemists have passed upon the methods employed by meteorologists, we think that in addition to destructive criticism, they should instruct us as to the path we should follow. Of course, we are not for a moment suggesting that Dr. Angot should have done this; all that we say regarding his book is, that in his 400 pages half of one might have been devoted to ozone.

On page 357 there are three charming and unique diagrams—two from the vicinity of Paris, and one from Little Rock, Arkansas, U.S.A., giving, on the natural scale, the depression shown by recording aneroids during the passage of whirlwinds very near to them. In each case the duration of passage is so short that it is not possible to distinguish between the down and the upstroke of the pen, and the amounts are about 0·3 in. When we remember (1) that these instruments were indoors, where friction would prevent the full diminution of pressure being felt; (2) that, considering the rapidity of transit of the depression, inertia and friction would prevent the pen going its full distance; (3) that there is no evidence that any one of these barometers was even momentarily at the true centre of the depression, we therefore conclude that out of doors a frictionless barometer would, in the centre of a depression, show a

diminution at least two or three times that above shown. Take it at only twice, and we get a difference of pressure of about 40 lbs. per square yard. Is it any wonder that buildings are burst open by the expansion of the contained air?

Among the many good sections of this book it is not easy to say that any one is the best; but we recommend all who treat themselves to a copy, to read the section upon *Orages de dépressions* (summer thunderstorms); it is excellent.

Seismology, by JOHN MILNE, F.R.S., F.G.S., &c. Kegan Paul, Trench & Co., London, 1898. Crown 8vo, xvi.-320 pages and 53 engravings.

QUITE recently we reviewed Prof. Milne's "Earthquakes" (same publishers), and knowing that the present work was to follow, we were much puzzled to know what boundary line could be laid down between the two subjects. As we expected, the author has not been able to draw one; and this is virtually an account of recent researches on the measurements of earthquakes (with a delicacy still quite unrealised by the general public), on the principles of construction best suited for countries where earth movements are large, and on the study of flexures of the earth's crust which produce no structural damage, but which cause trouble to astronomers by disturbing the level of their instruments. In fact, except from a publisher's view, we can see no reason why this should not have been called "Earthquakes, Part II."

The book, like all those written by Prof. Milne, is crammed with facts, illustrations and suggestions—so full indeed that sometimes one could wish for a little more narrative and consecutive argument instead of illustrative facts. All who have heard Prof. Milne lecture know how fascinatingly he runs on, conveying an enormous amount of information with apparently no fatigue either to lecturer or listener. It seems to us that when he has to write a book he feels more responsibility, regards it as a serious matter, and backs up every suggestion with an unassailable array of facts. He is perfectly safe inside the fortress thus constructed, and as in a volume of the International Scientific Series probably no joke is admitted, that fact also doubtless had a depressing influence upon the author. We can hardly give a better illustration of Prof. Milne's promptitude and of the delicacy of his instruments than by adding that the same issue of *The Times* which announced the recent earthquake in Greece, contained a telegram from Prof. Milne to the effect that that shock was duly recorded at his house in the Isle of Wight.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	87·9	22	45·9	8	76·1	55·9	54·6	71	99·1	42·2	1·13	10	5·3
Malta	92·3	3	67·0	1	85·7	73·1	68·1	75	151·5	61·0	·00	0	1·2
Cape of Good Hope	89·0	25	41·1	1	66·6	51·0	50·3	83	...	...	1·37	5	2·4
Mauritius	76·6	20*a*	59·2	6	74·8	64·1	60·0	75	126·2	52·5	6·61	16	6·0
Calcutta	90·4	1	75·1	30	86·5	78·3	77·9	88	157·2	75·9	17·68	19	8·9
Bombay	86·5	26	75·0	11	84·6	77·3	75·6	84	135·3	73·2	5·28	27	8·6
Ceylon, Colombo	88·1	10	75·0	23	86·3	77·7	73·1	79	150·0	71·5	·97	7	5·0
Melbourne	69·1	26	32·8	3	60·1	44·4	44·5	76	127·2	25·5	·89	10	5·6
Adelaide	74·4	26	36·4	17	63·6	46·9	46·2	73	135·6	29·5	2·15	13	5·5
Sydney	72·4	28	42·7	18	61·7	48·4	48·2	81	125·8	33·2	3·89	17	4·8
Wellington	62·0	28	31·9	1	53·1	42·1	38·1	71	92·0	19·0	5·76	18	5·0
Auckland	61·0	19	41·0	1	57·9	47·2	44·1	74	122·0	37·0	5·94	23	5·7
Jamaica, Kingston	91·8	9	71·1	1	88·1	73·4	70·9	76	...	...	1·86	12	...
Trinidad	90·0	1, 22	68·0	3	86·6	70·3	72·3	84	171·0	67·0	10·55	23	...
Grenada	85·0	24	68·4	17	82·6	73·5	71·6	80	150·0	...	19·11	23	3·6
Toronto	96·0	31	46·5	28	81·8	59·8	59·9	71	113·0	42·5	1·08	8	5·2
New Brunswick, Fredericton	81·7	9	45·0	29	73·7	55·8	56·1	70	...	...	4·66	13	6·1
Manitoba, Winnipeg	86·2	19	39·8	13	74·8	51·1	...	...	...	...	2·15	8	5·9
British Columbia, Esquimalt	88·0	10	45·2	29	72·3	51·2	..	...	...	...	·27	2	4·7

a—and 21, 29.

REMARKS.

MALTA.—Mean temp. 77°·5, or 0°·6 below the average, Mean hourly velocity of wind 7·3 miles. Mean temp. of sea 78°·8. L on 18th, 27th, 28th and 29th.
J. F. DOBSON.

Mauritius.—Mean temp. of air equal to, dew point 0°·7 above, and rainfall 4·19 in. above, the average. Mean hourly velocity of wind 12·0 miles, or 0·4 below average; extremes, 30·4 on 4th and 1·8 on 19th; prevailing direction E.S.E. and E. by S. The wettest August on record in 24 years. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·3, or 0°·7 above, of dew point 0°·1 above, and rainfall 2·90 in. below, the average. Mean hourly velocity of wind 8·6 miles; prevailing direction S.W. L on 16th and 25th. H. O. BARNARD.

Adelaide.—Mean temp. 1°·3 above, and rainfall ·22 in. below, the average for 41 years. C. TODD, F.R.S.

Sydney.—Temp. equal to, humidity 8° above, and rainfall 1·01 in. above, the average. Rains not so good as those in July. H. C. RUSSELL, F.R.S.

Wellington.—Cold and generally showery, with prevailing S.E. winds, and some very cold, frosty nights; finer weather towards the end. Earthquake on 7th. Mean temp. 0°·4 below, and rainfall ·56 in. above, the average. R. B. GOKE.

Auckland.—The early part and middle of the month were unusually wet and stormy; the end dry, or with slight showers only. Mean temp. slightly, and rainfall 1·75 in., above the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall ·23 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·53	XI.	Builth, Abergwesyn Vic.	14·61
II.	Dorking, Abinger Hall .	3·14	,,	Rhayader, Nantgwillt...	11·55
,,	Birchington, Thor	2·27	,,	Lake Vyrnwy	10·22
,,	Hailsham	3·06	,,	Corwen, Rhug	7·05
,,	Ryde, Thornbrough	3·81	,,	Criccieth, Talarvor	5·76
,,	Emsworth, Redlands ...	3·20	,,	I. of Man, Douglas	6·60
,,	Alton, Ashdell	4·18	XII.	Stoneykirk, Ardwell Ho.	4·40
III.	Oxford, Magdalen Col..	2·59	,,	New Galloway, Glenlee	7·96
,,	Banbury, Bloxham	3·20	,,	Moniaive, Maxwelton Ho.	7·09
,,	Northampton, Sedgebrook	2·99	,,	Lilliesleaf, Riddell	3·57
,,	Stamford, Duddington..	2·57	XIII.	N. Esk Res. [Penicuick]	6·40
,,	Alconbury	1·84	XIV.	Glasgow, Queen's Park..	5·61
,,	Wisbech, Bank House...	2·09	XV.	Inverary, Newtown	...
IV.	Southend	2·37	,,	Ballachulish, Ardsheal...	7·02
,,	Harlow, Sheering..... ...	2·04	,,	Islay, Gruinart School...	1·62
,,	Colchester, Lexden	1·80	XVI.	Dollar.....	6·78
,,	Rendlesham Hall	2·15	,,	Balquhidder, Stronvar...	9·63
,,	Scole Rectory	2·12	,,	Coupar Angus Station...	3·57
,,	Swaffham	2·06	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	3·38	XVII.	Keith H.R.S.....	4·08
,,	Bishop's Cannings	4·63	,,	Forres H.R.S.	2·56
,,	Blandford, Whatcombe .	4·90	XVIII.	Fearn, Lower Pitkerrie..	2·99
,,	Ashburton, Holne Vic...	8·83	,,	S. Uist, Askernish	7·18
,,	Okehampton, Oaklands.	9·23	,,	Invergarry.....	6·56
,,	Hartland Abbey	6·00	,,	Aviemore H.R.S.	...
,,	Lynton, Glenthorne ...	9·48	,,	Loch Ness, Drumnadrochit	3·91
,,	Probus, Lamellyn	6·06	XIX.	Invershin	4·08
,,	Wellington, The Avenue	6·00	,,	Durness	4·96
,,	North Cadbury Rectory	3·73	,,	Watten H.R.S.....	3·15
VI.	Clifton, Pembroke Road	5·17	XX.	Dunmanway, Coolkelure	12·06
,,	Ross, The Graig	3·88	,,	Cork, Wellesley Terrace	5·05
,,	Wem, Clive Vicarage ...	3·08	,,	Killarney, Woodlawn ..	9·32
,,	Wolverhampton, Tettenhall	3·31	,,	Caher, Duneske	5·05
,,	Cheadle, The Heath Ho.	3·95	,,	Ballingarry, Hazelfort...	3·65
,,	Coventry, Priory Row ..	3·82	,,	Limerick, Kilcornan ...	2·29
VII.	Grantham, Stainby	2·75	,,	Broadford, Hurdlestown	3·86
,,	Horncastle, Bucknall ...	2·28	,,	Miltown Malbay	5·35
,,	Worksop, Hodsck Priory	1·90	XXI.	Gorey, Courtown House	4·48
VIII.	Neston, Hinderton	3·22	,,	Moynalty, Westland ...	4·31
,,	Southport, Hesketh Park	3·73	,,	Athlone, Twyford	3·92
,,	Chatburn, Middlewood.	7·39	,,	Mullingar, Belvedere ...	4·02
,,	Duddon Val., Seathwaite Vic.	12·58	XXII.	Woodlawn	4·37
IX.	Melmerby, Baldersby ...	2·87	,,	Crossmolina, Enniscoe ..	5·88
,,	Scarborough, Observat'y	3·08	,,	Collooney, Markree Obs.	4·15
,,	Middleton, Mickleton ...	5·85	,,	Ballinamore, Lawderdale	3·84
X.	Haltwhistle, Unthank...	3·60	XXIII.	Warrenpoint.....	4·59
,,	Bamburgh	2·22	,,	Seaforde..	5·38
,,	Keswick, The Bank.....	10·26	,,	Belfast, Springfield	4·63
XI.	Llanfrechfa Grange	7·11	,,	Bushmills, Dundarave..	3·51
,,	Llandovery	7·95	,,	Stewartstown	3·58
,,	Castle Malgwyn	8·56	,,	Killybegs	6·55
,,	Brecknock, The Barracks	6·40	,,	Horn Head	8·72

JANUARY, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	2·52	+ ·90	·46	15	20	56·2	21	28·1	25
II.		Tenterden ...	2·10	+ ·20	·36	15	19	54·0	4	30·0	31
,,		Hartley Wintney ...	3·04	...	·60	12	21	54·0	21	24·0	25
III.		Hitchin ...	2·46	+ ·92	·48	15	19	53·0	15*a*	24·0	24*f*
,,		Winslow (Addington) ...	2·54	+ ·73	·45	20	20	53·0	*c*	24·0	25
IV.		Bury St. Edmunds (Westley)	2·09	+ ·62	·35	15	20	54·0	20	20·0	25
,,		Norwich (Brundall) ...	2·24	...	·41	11	22	56·0	21	24·6	6
V.		Winterbourne Steepleton ...	5·59	...	1·11	20	23	53·0	13	23·3	25
,,		Torquay (Cary Green)	5·49	...	1·10	20	19	54·9	13	30·0	29
,,		Polapit Tamar [Launceston]..	6·73	+ 3·71	1·03	1	22	57·8	12	25·7	24
VI.		Stroud (Upfield) ...	3·93	+ 1·73	·57	20	24	53·0	20	25·0	25
,,		ChurchStretton(Woolstaston)	4·27	+ 2·11	·75	20	21	53·0	15	24·0	26
,,		Worcester (Diglis Lock) ...	3·39	+ 1·59	·69	21	22	...	..	...	...
VII.		Boston ...	2·03	+ ·64	·40	11	18	55·0	22	28·0	25
,,		Hesley Hall [Tickhill]...	2·14	+ ·37	·36	15	22	57·0	21	20·0	26
,,		Breadsall Priory ...	3·31	...	·42	15	21	58·0	20	24·0	25
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	3·68	+ 1·79	·47	15	19	...	...	...	...
,,		Skipton (Arncliffe) ...	12·40	+ 6·76	2·75	18	25	...	...	...	...
,,		Hull (Pearson Park).	1·68	— ·09	·23	1	19	56·0	21	23·0	25
X.		Newcastle (Town Moor) ...	2·72	+ ·91	·45	2	19	...	...	...	...
,,		Borrowdale (Seathwaite)...	21·35	+ 9·17	4·78	18	20	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	6·64	+ 3·35	1·18	20	25	...	...	...	...
,,		Haverfordwest	8·26	+ 3·84	1·62	20	21	53·9	13	25·3	29
,,		Aberystwith (Gogerddan) ...	6·28	+ 2·75	1·30	20	20	50·0	4*d*	...	...
,,		Llandudno...	4·58	+ 2·30	·73	18	20	56·0	18	25·5	28
XII.	SCOTLAND.	Cargen [Dumfries]	7·06	+ 3·29	·98	18	18	51·0	4*a*	18·0	27
XIII.		Edinburgh (Blacket Place)...	3·69	...	·62	20	21	51·5	19	22·0	27
XIV.		Colmonell ...	5·21	...	·63	18	20	52·0	18	18·0	27
XV.		Tighnabruaich ...	7·46	...	·92	18	21	45·0	18*e*	25·0	27
,,		Mull (Quinish)...	5·74	+ ·07	·88	17	21	...	...	...	...
XVI.		Loch Leven Sluices ...	6·20	+ 3·30	·90	16*a*	18	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·40	+ 1·43	·45	20	20	47·1	19	19·8	25
XVII.		Braemar	2·68	— ·01	·75	21	21	49·0	5	9·5	27
,,		Aberdeen (Cranford)	4·02	...	·56	2	26	46·0	17	13·0	24
,,		Cawdor (Budgate) ...	3·77	+ 1·60	·60	20	18	...	...	...	...
XVIII		Strathconan [Beauly] ...	3·79	— 1·09	·80	19	...	...	...	...	...
,,		Glencarron Lodge...	7·70	...	1·83	18	21	51·7	9	20·0	25
XIX.		Dunrobin ...	4·24	+ 1·78	1·30	21	15	49·0	28	25·5	27
,,		S. Ronaldshay (Roeberry) ...	5·46	+ 2·51	1·07	18	24	46·0	9,10	26·0	16
XX.		Darrynane Abbey...	6·69	...	·58	20	22	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·67	+ 2·11	·93	20	23	54·5	15	24·0	24
,,	IRELAND.	O'Briensbridge (Ross) ...	...	...	...	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	4·42	+ 1·52	·65	20	23	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·48	+ ·62	·47	6	24	55·7	4	28·3	24
XXII.		Ballinasloe	4·43	+ 1·35	·59	11	23	54·0	3	27·0	27*g*
,,		Clifden (Kylemore)	8·15	...	·75	5,21	21	...	...	...	...
XXIII		Waringstown ...	3·16	+ ·51	·65	17	19	54·0	19	19·0	28
,,		Londonderry (Creggan Res.).	3·90	+ ·48	·50	17*b*	23	...	...	...	...
,,		Omagh (Edenfel) ...	4·74	+ 1·72	·82	18	22	51·0	4,20	22·0	27*h*

+ Shows that the fall was above the average ; — that it was below it.

a. *b*—and 18. *c*—Various. *d*—and 8, 21. *e*—and 21. *f*—and 25. *g*—and 28
h—and 28.

METEOROLOGICAL NOTES ON JANUARY, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Another warm month, with temp. above 50° on 14 days, but there were five brilliant days from 24th to 28th, with E. wind, and a colder feeling and more ice than the temp. seemed to warrant. Much wind, the worst gales being, from N.W. on 2nd and 3rd, W. on 12th, and S.W. on 20th and 21st. Duration of sunshine 86 hours. Mean temp. 42°·6. Wells rose a little, some considerably; others still very low. L in S. on 16th, followed by high wind.

HARTLEY WINTNEY.—An abnormally mild and wet month. Rough and stormy, with strong S.W. winds for the first three weeks, and heavy gales on 20th, 21st, and 22nd. Keen dry N.E. winds and frosts during the last week. Springs rapidly rising. Fog on 29th and 31st. Ozone on 22 days. Snowdrop and primrose in flower on 15th; crocus on 22nd.

ADDINGTON.—The greatest rainfall in January since 1886. The month was generally mild, with frequent high wind, and although frost was registered on nine nights, it was not severe, and the ponds were never quite covered with ice. The brook was much flooded on 20th and 21st.

WESTLEY, BURY ST. EDMUNDS.—A mild, windy month, with R in small quantities on many days.

NORWICH, BRUNDALL.—A very mild month, though the mean temp. (41°·7) is 1°·4 lower than that of January, 1898. Heavy gales occurred at times, principally from S.W., and the weather was generally unsettled and very mild till 23rd, after which N. winds were prevalent, with lower temp. but no severe frost. L on 16th. S on 2nd; sleet and H on 23rd and 24th.

WINTERBOURNE STEEPLETON.—The features of the month were the great rainfall and high temp. for the first three weeks, and after that a succession of cold and bright days. By the 20th all the springs in the valley of Winterbourne were running over. Mean temp. 42°·0, but the mean of the first three weeks was 44°·5. S on 2nd. Fog on hills on 6th and 15th.

TORQUAY, CARY GREEN.—R 2·38 in. above the average; mean temp. 44°·8, or 3°·0 above the average. Duration of sunshine 50 hours 5 mins., or 12 hours 55 mins. below the average; 8 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The wettest January in 19 years. The middle third of the month was remarkably wet and stormy, accompanied by unusually high temp. H on 1st, 2nd, 11th and 12th. Gales from N.W. on 2nd, W.S.W. on 12th, S.W. on 13th and S.S.W. on 21st. L and T on 2nd and 16th; T on 11th.

STROUD, UPFIELD.—N.W. gale on 2nd; S.W. gales on 12th, 20th and 22nd. Slight S on 2nd.

WOOLSTASTON.—A wild, wet month, with constant gales of great violence—that on 12th being especially furious, and accompanied by H and T. The continuous R caused sudden and extensive floods throughout the valley of the Severn, and much damage was done. On 24th, a sharp frost set in, and continued to the end of the month. Mean temp. 38°·7. T on 16th; a little S on 1st.

BREADSALL PRIORY.—Very wet and mild in the first part of the month, followed by several sharp frosts.

ARNCLIFFE VICARAGE.—The heaviest rainfall ever recorded in one month here. In the seven days 15th to 21st, 7·88 in. fell.

WALES.

HAVERFORDWEST.—January was characterised by excessive R and mildness, and from 9th to 23rd atmospheric conditions of the most disturbed character prevailed. On the night of the 23rd, after two days of unprecedented R, which produced enormous floods, exceeding anything experienced since 1869, the wind suddenly changed to N.E., and a severe frost set in, which lasted till the 29th, when a partial thaw occurred, followed by frost again.

GOGERDDAN.—The first three weeks were very wet, with strong winds, mostly from S. and S.W.

SCOTLAND.

CARGEN [DUMFRIES].—Wet, unsettled weather prevailed during the first three weeks; excessive R, high temp., and almost entire absence of sunshine characterising the period. Although the mean temp., 38°·2, closely approximates the average, unwonted warmth characterised the first three weeks; the mean temp. of the first 22 days being 41°·4, and of the last 9 only 30°·0. Rainfall is the heaviest in January since 1882, when 7·54 in. fell. Gale from W. on 12th. S on 17th. H on 16th. Lunar halos on 27th and 28th. Vegetation very forward until checked by the frost.

EDINBURGH, BLACKET PLACE.—Very mild till 22nd, with strong S.W. winds and much R. The last 9 days cold and dry. Temp. 1°·3, and rainfall 52 per cent., above the average. S on 12th and 16th. Sleet on 12th. Fog on 25th and 28th. Solar halo on 31st.

COLMONELL.—R ·74 in., and temp. 2°·4, above the average of 22 years. L on 11th.

TIGHNABRUAICH.—For the first two-thirds of the month the weather was excessively wet; for the remainder, frosty. S on 17th.

MULL, QUINISH.—The wet and stormy weather of December, 1898, continued without intermission till January 23rd, when it suddenly cleared up, and fine weather with slight frost prevailed till the end of the month.

ABERDEEN, CRANFORD.—Very little S, but many gales of wind and much R.

S. RONALDSHAY, ROEBERRY.—Very wet and changeable, and the wettest January in 32 years. Mean temp. 38°, or 0°·3 below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—The first three weeks were very wet, mild and close, but from 23rd to the end was very cold and dry, with E. wind and frost from 27th to 29th. From December 22nd to January 22nd inclusive there was no day without R, the total fall being 9·41 in.

WATERFORD, BROOK LODGE.—All the early part of the month was very wet and stormy, also very mild. East winds prevailed during the last week. S on 2nd. S on the Comeraghs on 1st and 11th. Fog on 29th,

DUBLIN, FITZWILLIAM SQUARE.—Cloudy, rainy and generally open. R fell on each of the first 22 days, followed by a dry, cold period. Mean temp. 42°·7, or 1°·3 above the average. Fog on 10 days. High winds on 13 days, reaching the force of a gale on S. S and sleet fell on 2nd, 11th, and 17th; H on 2nd. The temp. in shade exceeded 50° on 13 days.

OMAGH, EDENFEL.—Up to the 22nd the weather was made up of strong gales, heavy R and mild temp. From 23rd calm, clear and frosty weather prevailed, which was of much benefit to the country. From 1.30 to 2.30 p.m. on 12th there was a violent hurricane, doing an amount of damage to roofs, windows and trees, which, had the gale been prolonged, would have been almost unprecedented.

No. CCCXCVIII.] [PRICE FOURPENCE.
VOL. XXXIV. Or 5s. per annum post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

PAGE
Extremes of Temperature in London and its Neighbourhood for 104 Years 17
Floods in January, 1899 18
Royal Meteorological Society 19
On a recent Recurrence in Weather 20
Will-o'-the-Wisp 21
REVIEWS:—
Regen-karte der Provinz Schlesien mit erläuterndem text und tabellen 23
Annuario storico meteorologico Italiano 24
Cloud Observations in Victoria 24
Annales de l'Observatoire Météorologique ... du Mont Blanc 25
Climate of Cuba 26
Results of Meteorological Observations at Camden Square during February for 40 Years, 1858-97 27
Climatological Table for the British Empire, September, 1898 ... 28
Supplementary Table of Rainfall, February, 1899 29
Rainfall and Temperature in February, 1899, at 50 Stations ... 30
Meteorological Notes on February, 1899 31

MARCH, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: E. STANFORD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy
Meteorological Societies, and of the British Astronomical Association; Article
by various eminent Astronomers, English, American, and Continental
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assistan
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valua
publication.—*Prof. Young*, in "*Ten Years' progress in Astronomy.*"

All communications should be addressed to the Editors of "The Observatory"
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 15

NOTICES.

It is requested that all Books for Review, and Communications
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in
letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCXCVIII.] MARCH, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

EXTREMES OF TEMPERATURE IN LONDON AND ITS NEIGHBOURHOOD FOR 104 YEARS.

ON February 10th the shade temperature at Camden Square rose to 64°·8; this was much above any temperature previously recorded in February, either at Camden Square or at Greenwich, for at least fifty years.

It led us to look farther back, and finally we have prepared the following little table, which we hope will be generally acceptable.

Absolute Maxima.

Reference.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
A	57°·7 1843	61°·0 1821	66°·0 1803 1820 1822	77°·0 1807	84°·0 1807	87°·5 1826	93°·5 1808	89°·0 1800	83°·0 1810	75°·0 1802	63°·0 1821	58°·0 1821
B	57·0 1843	62·3 1846	71·5 1848	81·5 1865	87·0 1868	94·5 1858	97·1 1881	94·2 1884	92·1 1868	81·0 1859	67·3 1847	62·4 1848
C	56·4 1877	62·5 1868	70·1 1858	81·4 1865	87·6 1868	92·6 1858	94·6 1881	93·6 1893	91·0 1868	80·9 1859	63·9 1894	58·9 1888

Absolute Minima.

A	7·0 1795	17·7 1830	23·0 1800	27·0 1808	31·0 1802	40·0 1797 1802	44·5 1796	45·4 1839	37·0 1824	30·0 1796 1810 1856	23·8 1827	4·0 1796
B	4·0 1841	7·7 1845	13·1 1845 1890	23·0 1847	28·1 1877	35·6 1869	38·7 1863	38·1 1864	30·6 1885	24·7 1890	18·3 1890	8·0 1860
C	6·7 1867	7·3 1895	15·6 1890	24·5 1859	28·4 1892	35·6 1869	40·3 1863	38·2 1864	33·0 1872	23·8 1890	20·1 1858	6·7 1860

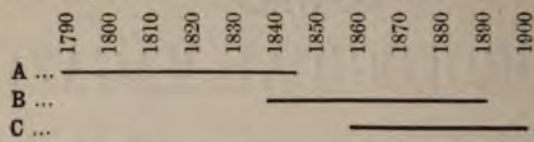
A. Royal Society, Somerset House, 1794–1843, by J. Glaisher, F.R.S., *Phil. Trans.*, 1850.

B. Royal Observatory, Greenwich, 1841–90, *Reduction of Greenwich Meteor. Obs.*, Part III.

C. Camden Square, 1858–97 abstracts in *Met. Mag.*, XXXIII.

The foregoing is probably sufficiently clear to need no explanation, but we will add a few words of comment by way of conclusion.

It will be noticed that the three records combined cover more than a century—roughly as is indicated by these lines :—



Except during January, the maxima given by series **A** are in every month lower than those for **B** or **C**; and, except in December, the minima are always higher—that is to say, the range of temperature shown by the **A** record is considerably less than at **B** and **C**. This might be due to an increase in the variability of climate, but it is probably really due to one or more of the following causes :—(1) The thermometers at **A** were suspended outside a window on the N. front, and on the first floor, of Somerset House, a cool position during the hot part of the day ; (2) The position in the very centre of London would be much warmer at night than in the open country ; (3) From 1794 to 1841 the patterns of registering thermometers were inferior to those now in use.

We therefore think that the difference is not due to any real change in climate, but to difference in mode of observation.

The extremes for **B** and **C** agree very closely, but **B** (Greenwich) is hotter on very hot summer days. Whether this is real or due to the limited space hitherto allowed for meteorological purposes will, we believe, soon be shown by the records from the new station in Greenwich Park.

In any future table, carried down to date, the max. values for February will have to be for Greenwich **B 63°·9** in 1899 instead of **62°·3** in 1846, and for Camden Square **C 64°·8** in 1899 instead of **62°·5** in 1868.

FLOODS IN JANUARY, 1899.

WE take it as a compliment that directly a word is wrong in these pages somebody writes to point it out. On page 5 of the last number, in the second line of the second paragraph, we stated, on the authority of several newspapers, that "A few houses were invaded at ETON, WINDSOR and EGHAM, and boats, &c." We are informed that *no* house in ETON or WINDSOR was flooded. Accepting this correction, it seems to us to strengthen the arguments at the beginning and end of the sentence. We understand that the level was 2 ft. 5 in. below that reached in 1897.

We shall be glad to be favoured with any details of damage by these floods, and photographs showing their extent.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 15th, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair.

PHENOLOGICAL REPORT.

Mr. E. Mawley read his annual report on the Phenological Observations, and stated that the weather of 1898, taken as a whole, had been throughout the British Isles very warm and dry. Wild plants blossomed much in advance of their average dates until about the end of March, but after that time, until the close of the flowering season, they were mostly late in coming into bloom. Favoured by the rains in May, the crop of hay was everywhere a remarkably heavy one, but the long drought which followed dried up the pastures and caused a scanty yield of roots. The dry season suited the cereals admirably, and especially the wheat, of which there was a very abundant crop. The yield of barley was nearly as exceptional, while that of oats, except in the north-east of England, and in Scotland, was also unusually good. There was a splendid crop of potatoes in Ireland and in parts of Scotland, but elsewhere the yield was moderate. Apples, pears and plums flowered abundantly, but adverse weather conditions, and the dry sub-soil in the spring, caused an irregular "set" of fruit; so that in all parts of the Kingdom these crops were, as a rule, below average. On the other hand there were good crops of all the smaller fruits.

CIRCULATION OF THE ATMOSPHERE.

A paper by Prof. W. M. Davis, of Harvard University, U.S.A., on "The Circulation of the Atmosphere," was read by the Secretary. The author said that the circulation of the atmosphere is ordinarily inadequately treated, inasmuch as the serious student seldom gains from the text-books in current use a comprehensive view of this great problem. After giving a brief historical development of the subject, the author went more particularly into the question of the outflowing polar winds, especially in the Antarctic regions. He called attention to the remarks made by Dr. Buchan, at the conference on the "Scientific Advantages of an Antarctic Expedition," held at the Royal Society last year, and maintained that Prof. W. Ferrel's views on the circulation of the atmosphere, as far as they touch Antarctic winds and pressure, had been misunderstood. Prof. Davis said that the convectional circulation of the atmosphere, as ordinarily stated was seriously incompetent, for the most striking features in the distribution of atmospheric pressure are not accounted for by it. As long as the effect of the winds in modifying the distribution of pressure is left out of consideration, no broad understanding of atmospheric processes can be reached.

ON A RECENT RECURRENCE IN WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—One often finds weather curiously repeated—a recurrence of the same kind of weather, time after time, at about the same intervals, for a limited period. It is well, I think, to note such recurrence, if at all frequent or persistent. It sometimes throws light on the way in which certain popular beliefs about weather may have arisen. Sometimes it may afford a presumption as to coming weather. As to causation, this may be quite obscure; but the meteorologist does well to remember the possibility of some influence, (terrestrial or cosmic) on weather, being at one time apparent, at another masked by some other influence.

The following facts and figures relate to the last eight months (July, 1898, to February, 1899). Consider each week, or group of seven days, having a day of new moon central, and the same for full moon; tabulate for each of these days the plus or minus value of mean temperature (from the Greenwich tables); next add the values for each seven-day group, and take the averages. Also note the numbers of plus and minus values in each group. Thus we have these tables:—

NEW MOON. Days.	Sum of differences from aver.	Average difference.	+ cases.	− cases.
	°	°		
1. July 18	+ 8·5	+ 1·2	4	3
2. Aug. 17	+54·2	+ 7·7	7	—
3. Sep. 16	+49·4	+ 7·1	6	1
4. Oct. 15	+ 8·7	+ 1·2	4	3
5. Nov. 14	+43·9	+ 6·3	7	—
6. Dec. 13	+55·4	+ 7·9	7	—
7. Jan. 11	+49·2	+ 7·0	7	—
8. Feb. 10	+83·1	+11·9	7	—
	Sums.....	+50·3	49	7
FULL MOON. Days.	Average	+ 6·3		
1. July 3	− 5·1	− 0·7	3	4
2. Aug. 2	+ 2·7	+ 0·4	4	3
3. ,, 31	+ 7·9	+ 1·1	3	4
4. Sep. 29	−12·3	− 1·8	—	7
5. Oct. 29	+41·4	+ 5·9	6	1
6. Nov. 28	+ 4·2	+ 0·6	3	4
7. Dec. 27	+33·4	+ 4·8	5	2
8. Jan. 26	−15·3	− 2·2	1	6
9. Feb. 25	−21·5	− 3·1	2	5
	Sums	+ 5·0	27	36
	Average	+ 0·6		

The greater warmth generally in weeks about new moon is thus apparent. Excepting Nos. 5 and 7 in the full moon table, all the

values of the latter in the "average difference" column are *under* the lowest value in the other table.

I give these facts as I find them, and do not affirm lunar influence in the case, especially as the data for some time previous to July do not apparently yield a like result. Still, the facts seem worth consideration by those who think the idea of the moon having anything to do with our weather is quite exploded.

It remains to be seen how much further the correspondence in question will be traceable.—Yours faithfully,

ALEX. B. MACDOWALL.

[Has the author been reading Webster's *Recurring Atmospheric Periods*, 1857? if not, it is curious that he should use the word so often.—ED.]

WILL-WI'-THE-WISP.*

THE phenomenon known as "will-o'-the-wisp" appears so rarely that its existence has been doubted by some scientists. It is observed most frequently in graveyards and in muddy channels. In graveyards, where the gas escapes from the soil, without traversing a layer of water, the will-o'-the-wisp takes the form of a long flame; in the water the gas escapes in bubbles that take fire on reaching the air, producing, when the air is calm, white wreaths of phosphoric anhydride. These phenomena can be reproduced artificially with all their characteristics by burying in moist soil, or by throwing into the water, some calcium phosphide, a substance prepared by causing phosphorus vapour to pass over red-hot lime. Under the action of the water, the phosphide gives off the gases hydrogen and hydrogen phosphide, which inflame spontaneously on coming into contact with the oxygen of the air. The white rings are due to the combustion of the phosphorus, which gives rise to phosphoric anhydride, a white powder that takes the form of wreaths. The formation of wreaths is due solely to the issue of smoke through the circular opening made by the bubble in issuing from the water. All smoke while escaping suddenly through a circular hole forms similar wreaths.

I had occasion, during the months of August and September last, to observe some very numerous and intense will-o'-the-wisps in the port of Croisic (Loire-Inférieure). During several evenings, especially about the middle of August, the production of will-o'-the-wisps became so abundant and manifested itself with so much energy that the phenomen was noticed by all the bathers and sailors on the quays. The sailors were particularly astonished, for these will-o'-the-wisps were entirely new to them. The captain of the port of Croisic, although he had lived many years in the place, said that this was the first time in his life that he had ever seen these singular lights. It is unnecessary to add that both bathers and sailors gave the most fantastic explanations of the phenomenon. I owe it to the truth to confess that at first I

* For personal testimony as to this phenomenon see also *Met. Mag.*, Vol. XV. (1880), p. 156.

thought it was the trick of some chemist, who was amusing himself by throwing into the sea sticks of calcium phosphide; but this hypothesis was not admissible. The bubbles were so large that to produce them there would have been required sticks of huge dimensions, not found in commerce. Besides, the will-o'-the-wisps reappeared every evening and over a considerable extent of water, so that it would have been necessary to undergo a large expense, quite disproportionate to a simple practical joke. I never saw anyone throw the smallest object into the sea. Finally, all my doubts were removed by the fact that the bubbles of gas, which were very large in August, during the season of thunderstorms, became smaller and smaller during September as the temperature fell. Towards September 20, when the phenomenon ceased, only very small bubbles appeared, though perhaps they were more numerous and scattered over a very great surface. It was then necessary to conclude that the productive cause of the phosphuretted hydrogen underwent variations corresponding to the changes of temperature and electric state of the atmosphere. Just as certain ferments decompose mineral and organic bodies rich in sulphur and produce sulphuretted hydrogen, so there must exist in the waters of the port of Croisic ferments hitherto unknown, capable of decomposing phosphates and organic substances rich in phosphorus, setting free phosphuretted hydrogen. Now we know how atmospheric conditions act on ferments. On certain days, especially during thunderstorms, milk sours with prodigious rapidity, and meat also spoils in a few hours.

I will close by giving some details regarding the production of the will-o'-the-wisps. These were very large and reproduced on a large scale the well-known experiment of bubbles of phosphuretted hydrogen obtained by the action of water on calcium phosphide. I observed plainly the formation of the white fumes of phosphoric anhydride, and the characteristic odour of garlic. Wreaths were not produced, because of the constant agitation of the air. The bubbles occurred principally in the two basins that adjoin the fish market, whence the refuse is often cast into the water, especially the heads of sardines. They rose somewhat in all parts of these basins, but especially in certain localities where the tide would heap up the refuse. This part of the port of Croisic is very clean, and contains no mud. The bubbles sometimes reached an enormous size. I saw flashes so bright that the whole port was illuminated as if by lightning. I noticed sometimes, but quite rarely, regular series of bubbles in a straight line, as if the substance from which the bubbles were escaping were carried along by the current. Some persons, I should say, believed that the bubbles were due to the putrefaction of large jellyfish, then quite abundant. The production of the will-'o-the-wisps was coincident generally with the phosphorescence of the sea, another phenomenon quite distinct from it, and having quite another origin. I have, nevertheless, about the middle of September, seen will-o'-the-wisps when the sea presented no trace of phosphorescence.—Dr. M. A. Blunard, in *La Nature*.

REVIEWS.

Regen-karte der Provinz Schlesien mit erläuterndem text und tabellen in amtlichem auftrage bearbeitet von Prof. Dr. HELLMANN, Dietrich Reimer, Berlin 1899. Roy. 8vo, 24 pp., one coloured map.

IN the summer of 1887 the Roy. Meteor. Institute of Silesia distributed about 200 new rain gauges to various persons in that province. The present pamphlet deals almost exclusively with the results of these and other gauges during the decade 1888-97.

Silesia has a length N.W.—S.E. of about 200 miles and an average breadth of 80 miles, therefore its area is roughly 16,000 square miles, or about a seventh of that of the British Isles. Dr. Hellmann gives results for 294 stations which would, on the average, give about one station to each 50 square miles, but he does not give a map showing their positions, and it is, therefore, not easy for a foreigner to ascertain whether they are equably distributed. We agree with the author as to the desirability of placing only a few names on the map, but 300 small black dots would give valuable information and obscure nothing. We should have preferred to find the true mean printed over the site of each station, as in the map between pp. 22–23 of *Brit. Rain.*, 1897; or alternatively the coloured map (which is excellent) might be left as it is, each station in the table might have a consecutive number, and an outline map might be printed (uncoloured) from the same stone, and small rings containing the number might be placed over the site of each station.

We are quite ready to accept Dr. Hellmann's curves, but think that it is always well to produce the facts on which they are based.

The head line of the table on pp. 12–13 misled us, and may possibly mislead others. It is true that in the text it is stated "for Görlitz there is a continuous record for 50 years and that for some of the other stations the 50-year mean can be obtained by computation"; but still it seems to us rather misleading to head the column "50 years' mean" and in no way to indicate which are "observed" values and which "computed" ones, or on how many years the latter are based—the addition of three columns "Period observed," "Number of Years," "Mean observed," would have enabled one to realize the precise value to be attached to the subsequent columns. Apparently part of this information is given in Table II., but if so there is a good deal of "computing," for only one record is complete for the 50 years, one for 47, one for 40, two are for between 30 and 40, and all the others for 28 or less.

We have mentioned, as is our duty, points which seem to us weak, but wish as a whole to write of the pamphlet with warm approval; we do not remember one of equal size which gives so much all round information on the various details of rainfall. Mean annual fall (22 inches on the plains, 45 on the mountains) and the probable limits of its fluctuation, percentage falling in each month

(chiefly in summer—slight in winter, even on the mountains), greatest falls in individual months; also in days, hours, and even shorter periods—these are among the data given in this, which in many respects may be regarded as a pattern. Would that it were generally imitated.

Annuario storico meteorologico Italiano redatto dal P. GIUSEPPE BOFFITO Ba dell'Osservatorio di Moncalieri. Volume I. 1898. Torino, 1899. Post 8vo, 152 pages.

WE are glad to be able to offer a warm welcome to this annual. It is very good as far as it goes, and the Editor invites authors to send him copies of their works so that he may make it better. But we see no chance of it being ever possible to give in one small annual volume an abstract of *all* the works upon Meteorology published in the previous year—which is what Padre Boffito is attempting.

This little volume is divided into two parts. Part I. is entitled "Articles and Memoirs," and contains five:—(1) On the origin of the Magnetic Compass, and on some of its principal modifications; (2) On Sunspots and Terrestrial Magnetism; (3) Doni, a precursor of Galileo; (4) On an explanation of the star of the Magi, falsely attributed to Kepler; (5) On the Meteorology of Cecco [? 1260–1327 A.D.] as indicated by his *Acerba*.

Part II. is entitled "Bibliography," and is divided into two portions—Italian (notices of 135 works and occupying 64 pages) and Foreign (noticing 80 works and occupying 23 pages).

The articles in Part I. prove that in tracing the early history of Meteorology we may expect very valuable aid from Padre Boffito and the writers who are assisting him.

Part II. is, as we have already said, excellent as far as it goes; but evidence of the impossibility of this becoming more than a *contribution towards* a bibliography is afforded by the numbers quoted for Italy, and for the rest of the world. Italy has nearly twice the space, and nearly three times as many separate notices as all the rest of the world. If all the meteorological publications are to be noticed as fully as the Italian ones, instead of 23 pages, several hundred would be required. What is done is well done; but it serves chiefly to show how much more has to be accomplished.

Cloud Observations in Victoria, by P. BARACCHI, F.R.A.S., Government Astronomer, Melbourne. [Excerpt Report Australasian Assoc. for the Advance. of Science, 1898.] 8vo, 7 pages, 4 plates.

THE second report upon cloud work to reach us is this, which is merely a preliminary one, but interesting first, because it comes from nearly our antipodes and shows how widespread have been the efforts to carry out the proposals of the International Met. Com.,

and secondly, because the plates make it easy to follow the somewhat original methods employed at Melbourne.

In a few lines we can state only the general features of the method adopted. Two cameras were used—one at the Melbourne Observatory, the other at 6,820 ft. nearly due N. (N. 3° 38′ 51″ W.), on the roof of Parliament House. The cameras were extremely massive, made of heavy cast iron, built on stone columns, with the lens facing the zenith, and rigorously tested for precision in that respect. The dark slide was fitted in a massive brass frame running on a V-shaped groove, so that absolute identity of position for each plate was ensured.

When the 20,000 observations are all discussed, we expect to find that results of great excellence have been attained.

Annales de l'Observatoire Météorologique . . . . du Mont Blanc, par J. VALLOT. Tome III. 4to. Steinheil, Paris, 1898. xiv.-217 pages, map, and numerous illustrations.

AS regards contents, printing and illustrations, it is always a pleasure to read these sumptuous volumes, which embody the results of a devotion to science by the Vallot family which we are glad to see has been recognised by the French Government, who have given to M. J. Vallot the Cross of *Chevalier de la Légion d'honneur*; to his talented wife the decoration of *Officier d'Académie*, and to his brother, M. H. Vallot, that of *Officier de l'Instruction publique*. Rarely do three members of a family receive such recognition, but equally rare is it for a family to devote so much money and so much time to the prosecution of scientific work.

In noticing Tomes I. and II. we expressed our admiration of M. Vallot's vast and heroic undertaking; we need, therefore, merely refer to those reviews (Vol. XXX., p. 9, and XXXII., p. 42).

The contents of Vol. III. are—(1) Hourly temperatures at Chamonix 1,086 m. (3,563 ft.), Grands Mulets, 3,021 m. (9,911 ft.), and Bosses, 4,359 m. (14,301 ft.), with some very sensible remarks upon thermometer exposure for lofty stations; (2) Barometric means for the same stations; (3) Barometric diurnal range at the three stations; the disappearance at the high stations of the usual double maximum and minimum is very well illustrated by a series of diagrams; (4) Great barometric changes, *e.g.*, the effect at different altitudes due to the passage of cyclones. M. Vallot does not seem well satisfied with this part of the work, and we are inclined to take the same view. We should have tried the effect of representing the pressure at Chamonix by a straight line, and laying off the differences between it and the upper stations hour by hour. Perhaps M. Vallot did that, and did not find it a success.

The next section is very important, but too long for us to epitomize. It describes, and gives the results of, experiments in Chemical

Actinometry carried out synchronously at two stations by M. and by Madame Vallot respectively. It is an excellent piece of work, extremely suggestive and well thought out.

The two following sections report the progress of M. H. Vallot's trigonometrical survey of the Mont Blanc district, in preparation for his entirely new map on the scale of 3 inches to the mile. Subsequent ones deal with the state of the tunnel near the summit, of the temperature in it, and the density of the ice; another, illustrated by a dozen photo-blocks, deals with the erosion due to glacier action—but we must stop.

All who are fortunate enough to obtain a copy will join us in applying to it the one word—"charming."

Climate of Cuba, also a note on the weather of Manila, by W. F. R. PHILLIPS. Prepared under the direction of the Chief of the Weather Bureau. Washington, 1898. 23 pp., 8vo.

OUR American friends have lost no time in collecting and tabulating all the meteorological data that they could find in the splendid library of the Weather Bureau, respecting Cuba, and the outcome is a satisfactory little paper.

We greatly regret that one result of the recent struggle was the death of our valued correspondent, Mr. F. W. Ramsden, H.B.M. Consul at Santiago, who could have rendered great assistance in the preparation of this paper.

Dr. Phillips has, we think, done his work well, and we agree with him that for low lying places like Habana, 77° may very well be accepted as the mean annual temperature; Dove gave 77°·2 more than half a century since. Monthly mean temperature is rarely below 70° or above 84°; absolute max. reaches 80° in every month of the year and 95° every year; but happily there are usually low minima in winter, 55° to 50°, and once to 49°·6.

As regards total annual rainfall, Dr. Phillips gives 52 inches for Habana, but his other records are in no case for more than one year, and therefore tell us very little. November to April are the drier months, June to October wet, with rain on nearly half of the days.

Manila is hotter, its mean temperature is given as 80°, the max. goes to 100°, and the absolute min. is 60°. There is a mistake on page 22, where it says "The lowest reading recorded is 74°, and was observed in January." 74° was the *mean temperature* of the coldest month January, but both in January and in December temperatures of 60° have been recorded.

As regards both Cuba and Manila one of the first things for the U.S. authorities to do, is to start Sanatoria at high altitudes.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

FEBRUARY.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry Mean, 9a.&9p.	Wet Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	1·80	5	·60	0	34·7	33·7	52·1	41·3	24·4	30·2	..	..	..	..	5·2
1859..	1·23	15	·22	0	42·5	40·3	57·9	49·3	28·7	35·6	..	..	..	..	5·8
1860..	1·25	15	·41	0	35·4	33·6	52·4	41·2	23·2	30·3	..	..	21·4	29·4	5·3
1861..	1·93	12	·56	0	41·6	40·0	54·7	47·6	23·2	36·8	..	..	18·8	33·1	6·8
1862..	·31	5	·10	0	41·1	39·7	56·1	45·7	23·2	36·9	..	..	17·6	33·4	7·4
1863..	·67	8	·20	0	41·2	39·7	53·6	48·0	24·5	36·0	..	..	17·8	32·2	6·4
1864..	·85	11	·29	0	35·9	34·9	54·4	42·0	18·9	31·4	..	..	12·6	28·6	6·9
1865..	2·01	20	·42	0	37·0	35·8	52·8	41·7	15·4	32·3	..	..	10·8	28·8	7·3
1866..	3·72	18	·49	0	40·5	38·8	55·8	47·2	25·2	36·1	..	..	18·1	30·2	5·5
1867..	1·44	11	·36	0	45·2	43·8	56·2	50·4	30·0	40·2	..	..	26·5	37·4	7·5
1868..	1·21	10	·50	0	43·3	41·1	62·5	50·1	26·6	38·3	..	..	23·0	34·8	6·3
1869..	2·48	17	·52	0	45·6	43·7	60·8	51·7	31·3	40·6	..	..	27·4	38·3	6·9
1870..	1·21	14	·35	0	36·6	35·4	54·9	41·8	20·1	32·4	87·1	63·3	17·2	29·7	7·2
1871..	1·27	14	·31	0	42·5	41·1	56·2	48·1	25·8	37·5	102·4	69·4	25·7	35·2	7·6
1872..	·96	15	·19	0	44·5	43·0	57·0	51·1	31·4	39·3	94·1	72·2	26·6	35·3	6·5
1873..	1·96	13	·61	0	34·7	33·2	50·1	39·5	25·8	31·3	88·3	55·1	24·1	30·1	8·9
1874..	·91	16	·58	0	38·7	37·7	54·5	44·8	22·4	33·3	89·8	60·9	19·5	31·1	6·5
1875..	1·06	16	·36	0	35·3	34·5	51·2	40·8	25·1	31·0	90·2	58·8	23·4	29·6	7·4
1876..	1·97	18	·36	0	41·2	39·7	58·6	46·7	23·0	36·6	99·0	69·0	21·0	33·9	7·0
1877..	1·78	17	·34	0	43·2	41·6	58·5	49·4	25·3	38·6	92·0	74·1	22·7	36·1	6·4
1878..	1·49	11	·41	0	42·3	41·0	59·7	47·7	25·7	37·7	98·2	64·2	23·8	34·1	8·0
1879..	3·77	24	·76	0	38·2	37·1	53·8	43·0	25·2	34·4	73·8	56·1	24·9	32·6	8·3
1880..	2·33	19	·43	0	41·2	40·3	53·7	47·8	27·0	35·9	93·5	68·4	22·3	31·8	7·1
1881..	3·09	16	·76	0	37·7	36·6	52·7	42·8	26·7	33·9	90·2	58·9	23·3	31·8	8·1
1882..	1·30	8	·38	0	41·7	40·3	56·2	48·2	24·6	36·3	95·4	64·8	19·4	33·0	7·6
1883..	3·62	14	·60	0	42·3	40·8	57·3	49·0	29·3	36·5	100·8	68·1	24·4	33·2	6·2
1884..	1·40	14	·30	0	41·7	39·9	56·3	48·2	28·2	37·2	81·7	64·4	25·0	33·6	6·7
1885..	2·86	18	·75	0	43·5	41·9	57·8	49·9	27·6	38·7	79·2	62·1	20·8	33·5	6·5
1886..	·63	8	·30	0	33·4	32·4	47·7	38·4	19·4	29·5	82·6	51·9	14·7	25·6	7·2
1887..	·48	5	·12	0	38·0	36·5	54·1	45·2	22·6	33·1	97·8	62·8	16·6	29·0	5·9
1888..	·78	14	·31	0	35·1	33·7	52·0	40·1	19·1	31·4	76·7	59·3	16·1	28·2	7·9
1889..	2·28	18	·63	0	36·5	35·1	58·1	43·3	20·4	31·7	86·3	65·3	13·5	28·1	6·8
1890..	1·05	9	·66	0	36·5	35·4	49·3	43·4	27·1	33·2	83·4	62·9	21·8	29·2	6·5
1891..	·01	1	·01	0	37·5	36·4	61·2	46·0	24·2	32·5	83·8	61·6	19·7	28·6	5·9
1892..	1·62	17	·43	0	38·4	37·1	53·0	44·7	17·5	33·9	86·1	62·3	12·2	30·4	6·9
1893..	2·87	22	·44	0	40·8	39·4	57·0	47·1	25·1	35·9	86·8	63·4	20·1	32·2	6·7
1894..	1·74	16	·41	0	41·3	39·4	56·4	47·8	23·3	35·5	91·1	67·0	18·0	31·1	5·7
1895..	·12	4	·06	0	28·8	27·8	46·2	36·1	7·3	22·5	80·8	58·2	5·0	19·0	5·8
1896..	·30	8	·08	0	39·6	38·2	56·4	46·2	23·2	34·7	86·9	63·4	19·8	30·9	6·9
1897..	2·75	14	·59	0	43·0	41·4	58·0	48·4	27·9	39·0	93·3	60·9	22·6	34·5	8·1
Mean ...	1·61	13	·40	0	39·5	38·0	55·2	45·5	24·1	34·7	89·0	63·2	20·0	31·5	6·8
Extremes	3·77	24	·76	0	45·6	43·8	62·5	51·7	31·4	40·6	102·4	74·1	27·4	38·3	8·9
	·01	1	·01	0	28·8	27·8	46·2	36·1	7·3	22·5	73·8	51·9	5·0	19·0	5·2

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	91·2	8	36·8	29	74·2	51·6	51·4	70	125·7	32·4	·33	4	4·0
Malta	86·3	9	65·1	30	81·9	68·9	65·1	77	147·8	61·5	2·50	9	2·1
Cape of Good Hope	79·9	25	41·0	14	64·9	49·0	49·6	82	...	...	3·16	13	5·2
Mauritius	78·4	14	58·3	28	75·9	63·8	60·6	76	129·6	49·9	1·34	10	5·0
Calcutta	90·9	30	75·5	20	87·3	77·8	76·5	84	157·0	75·5	8·00	11	8·2
Bombay	87·4	27	73·9	12	84·5	76·6	75·6	85	140·3	72·0	19·94	21	7·3
Ceylon, Colombo	38·7	15	73·8	29	86·4	76·6	73·7	82	152·0	72·0	6·90	23	5·7
Melbourne	72·8	25	40·0	10	62·5	47·5	43·9	71	129·0	30·2	2·90	13	6·1
Adelaide	80·6	25	39·3	28	67·8	48·2	46·6	68	144·9	34·4	·72	14	4·4
Sydney	...	...	...	...	...	...	...	..	..	..	...	...	...
Wellington	65·0	28	37·0	2	58·2	45·1	40·9	67	92·0	29·0	3·03	10	4·2
Auckland	65·0	24	45·0	17	60·2	48·5	45·5	71	124·0	42·0	2·25	22	4·9
Jamaica, Kingston	92·3	30	70·8	9	87·9	72·7	71·3	77	...	...	2·95	12	...
Trinidad	91·0	14	68·0	30	87·7	70·3	72·7	86	167·0	63·0	7·13	15	...
Grenada	88·2	27	71·2	21	83·2	74·3	73·0	81	154·0	..	12·02	18	2·8
Toronto	97·1	2	38·3	11	73·9	54·6	56·0	77	115·0	35·2	2·79	9	4·3
New Brunswick, Fredericton	81·7	5	26·0	25	66·5	45·2	46·5	67	...	...	1·53	9	4·9
Manitoba, Winnipeg	79·8	27	31·8	9	67·3	43·9	...	...	...	...	2·50	11	5·5
British Columbia, Esquimalt	85·0	6	37·3	30	67·0	47·9	..	...	...	...	1·79	9	5·2

Remarks.

Malta.—Adopted mean temp. 73°·7, or 1°·4 below average. Mean hourly velocity of wind 6·0 miles, or 1·9 below average. Mean temp. of sea 78°·2. TS8 on 5 days. L on 10 days. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·6 below, of dew point 0°·7 above, and rainfall ·09 in. below, the average. Mean hourly velocity of wind 10·8 miles, or 1·2 below average; extremes, 29·2 on 18th and 2·6 on 24th; prevailing direction E.S.E. T. F. Claxton.

Ceylon, Colombo.—Mean temp. of air 80°·6, or 0°·1 below, of dew point 0°·5 above, and rainfall 1·83 in. above, the average. Mean hourly velocity of wind 8·7 miles; prevailing direction W. and S.W. TS on 4th. H. O. Barnard.

Adelaide.—Weather generally very dry. Rain everywhere below average. Mean temp. 0°·9 above, and rainfall 1·03 in. below, the average for 41 years. C. Todd, F.R.S.

Sydney.—In the August table the dew point should have been 46°·2 and the grass min. 32°·8.

Wellington.—Generally fine up to the 13th; heavy R on 14th and showery to the 20th; the latter part of the month finer. Prevailing winds N.W.; frequently strong. L on 14th. Earthquake on 16th. Mean temp. 0°·7 above, and rainfall 1·23 in. below, the average. R. B. Gore.

Auckland.—No storms or heavy falls of rain during the month, the rainfall being less by an inch than the average of 31 years. Mean temp. close to the average. T. F. Cheeseman.

Trinidad.—Rainfall ·57 in. above the average of 30 years. J. H. Hart.

SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·14	XI.	Builth, Abergwesyn Vic.	8·73
II.	Dorking, Abinger Hall .	3·19	,,	Rhayader, Nantgwillt ...	8·61
,,	Birchington, Thor	1·88	,,	Lake Vyrnwy	3·86
,,	Hailsham	3·25	,,	Corwen, Rhug	2·86
,,	Ryde, Thornbrough	2·81	,,	Criccieth, Talarvor	2·52
,,	Emsworth, Redlands ...	2·93	,,	I. of Man, Douglas	2·89
,,	Alton, Ashdell	3·68	XII.	Stoneykirk, Ardwell Ho.	2·31
III.	Oxford, Magdalen Col..	1·82	,,	New Galloway, Glenlee	3·85
,,	Banbury, Bloxham	3·23	,,	Moniaive, Maxwelton Ho.	3·65
,,	Northampton, Sedgebrook	2·27	,,	Lilliesleaf, Riddell	2·05
,,	Stamford, Duddington..	1·63	XIII.	N. Esk Res. [Penicuick]	2·25
,,	Alconbury	·95	XIV.	Glasgow, Queen's Park..	1·84
,,	Wisbech, Bank House...	1·12	XV.	Inverary, Newtown	4·40
IV.	Southend	1·93	,,	Ballachulish, Ardsheal...	5·85
,,	Harlow, Sheering..... ...	2·61	,,	Islay, Gruinart School...	1·82
,,	Colchester, Lexden	1·31	XVI.	Dollar.....	2·43
,,	Rendlesham Hall	1·38	,,	Balquhidder, Stronvar...	6·83
,,	Scole Rectory	1·07	,,	Coupar Angus Station...	2·89
,,	Swaffham	·98	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	3·39	XVII.	Keith H.R.S.....	1·10
,,	Bishop's Cannings	3·06	,,	Forres H.R.S.	1·28
,,	Blandford, Whatcombe .	3·86	XVIII.	Fearn, Lower Pitkerrie..	1·32
,,	Ashburton, Holne Vic...	5·14	,,	S. Uist, Askernish	2·80
,,	Okehampton, Oaklands.	...	,,	Invergarry.....	1·66
,,	Hartland Abbey	3·15	,,	Aviemore H.R.S.	...
,,	Lynton, Glenthorne ...	5·18	,,	Loch Ness, Drumnadrochit	2·03
,,	Probus, Lamellyn	5·70	XIX.	Invershin	1·22
,,	Wellington, The Avenue	4·08	,,	Durness	2·06
,,	North Cadbury Rectory	3·14	,,	Watten H.R.S.....	1·03
VI.	Clifton, Pembroke Road	3·91	XX.	Dunmanway, Coolkelure	8·12
,,	Ross, The Graig	2·77	,,	Cork, Wellesley Terrace	4·36
,,	Wem, Clive Vicarage ...	1·52	,,	Killarney, Woodlawn ..	8·24
,,	Wolverhampton, Tettenhall	2·51	,,	Caher, Duneske	3·23
,,	Cheadle, The Heath Ho.	2·33	,,	Ballingarry, Hazelfort...	2·34
,,	Coventry, Priory Row ..	2·86	,,	Limerick, Kilcornan ...	2·91
VII.	Grantham, Stainby	1·50	,,	Miltown Malbay	3·03
,,	Horncastle, Bucknall ...	...	,,	Gorey, Courtown House	3·67
,,	Worksop, Hodsck Priory	1·47	XXI.	Moynalty, Westland ...	2·84
VIII.	Neston, Hinderton	1·21	,,	Athlone, Twyford	2·78
,,	Southport, Hesketh Park	1·55	,,	Mullingar, Belvedere ...	2·60
,,	Chatburn, Middlewood.	1·89	,,	Woodlawn	3·00
,,	Duddon Val., Seathwaite Vic.	5·77	XXII.	Crossmolina, Enniscoe ..	5·26
IX.	Melmerby, Baldersby ...	1·56	,,	Collooney, Markree Obs.	3·33
,,	Scarborough, Observat'y	...	,,	Ballinamore, Lawderdale	3·05
,,	Middleton, Mickleton ...	2·13	,,	Warrenpoint.....	4·14
X.	Haltwhistle, Unthank...	1·97	XXIII.	Seaforde.....	3·70
,,	Bamburgh	1·34	,,	Belfast, Springfield	3·04
,,	Keswick, The Bank.....	4·98	,,	Bushmills, Dundarave..	1·75
XI.	Llanfrechfa Grange	3·94	,,	Stewartstown	3·08
,,	Llandovery	4·36	,,	Killybegs	2·64
,,	Castle Malgwyn	5·10	,,	Horn Head	2·81
,,	Brecknock, The Barracks	6·19	,,		

FEBRUARY, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	2·00	+ ·12	·38	4	11	64·8	10	24·9	27
II.		Tenterden ...	2·51	+ ·39	·66	8	15	60·0	10	21·5	28
,,		Hartley Wintney ...	2·65	...	·55	6	12	62·0	10	21·0	26
III.		Hitchin ...	1·53	— ·22	·30	15	11	63·0	10	21·0	25
,,		Winslow (Addington) ...	2·04	— ·12	·40	6	11	61·0	10	20·0	27*c*
IV.		Bury St. Edmunds (Westley)	1·11	— ·45	·34	15	12	61·0	10	24·0	4
,,		Norwich (Brundall) ...	1·27	...	·33	15	16	63·6	10	23·8	28
V.		Winterbourne Steepleton ...	4·34	...	·88	12	12	55·9	17	21·8	28
,,		Torquay (Cary Green)	5·77	...	1·22	5	14	59·4	9	28·2	3
,,		Polapit Tamar [Launceston]..	3·60	+ ·33	·55	13	12	59·4	9	19·6	3
VI.		Stroud (Upfield) ...	3·18	+ ·62	·78	15	14	57·0	9, 10	25·0	3, 27
,,		ChurchStretton(Woolstaston)	3·54	+ 1·09	·71	13	14	55·5	10	23·5	26
,,		Worcester (Diglis Lock) ...	2·53	+ ·56	·50	6	12	...	..	...	...
VII.		Boston ...	·92	— ·76	·22	15	12	62·0	10	24·0	28
,,		Hesley Hall [Tickhill]...	1·49	— ·01	·31	15	9	59·0	10	21·0	22
,,		Breadsall Priory ...	1·46	...	·31	6	13	58·0	28	20·0	4
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·33	— ·25	·35	9	9	...	...	...	...
,,		Skipton (Arncliffe) ...	4·53	— ·16	1·16	9	14	...	...	...	...
,,		Hull (Pearson Park).	1·00	— ·80	·18	7, 15	9	61·0	10	24·0	4, 24
X.		Newcastle (Town Moor) ...	·89	— ·51	·22	1	11	...	..	...	...
,,		Borrowdale (Seathwaite)...	9·07	— 2·57	2·22	13	13	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	3·99	+ ·80	·76	4	14	...	...	...	...
,,		Haverfordwest	5·18	+ 1·06	·88	20	13	54·7	9	23·4	3
,,		Aberystwith (Gogerddan) ...	2·08	— 1·18	·46	7	11	55·0	11*a*	...	...
,,		Llandudno...	2·35	+ ·43	·44	11	15	65·0	10	27·0	4
XII.	SCOTLAND.	Cargen [Dumfries]	4·36	+ ·71	·74	8	11	52·0	22*b*	19·0	4
XIII.		Edinburgh (Blacket Place)...	1·45	...	·31	17	11	53·9	17	22·1	27
XIV.		Colmonell ...	2·97	...	·62	8	14	53·0	10	19·0	2
XV.		Tighnabruaich ...	3·19	...	·57	8, 10	11	47·0	28	26·0	3
,,		Mull (Quinish)...	4·19	— 1·28	·84	9	14	...	...	...	...
XVI.		Loch Leven Sluices ...	2·80	+ ·05	·60	11	10	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·30	+ ·20	·50	8	13	51·7	11	23·3	4
XVII.		Braemar	1·96	— 1·40	·45	10	13	52·8	27	11·0	5
,,		Aberdeen (Cranford)	2·56	...	·51	9	17	53·0	12*c*	...	...
,,		Cawdor (Budgate) ...	1·46	— ·77	·45	17	9	...	...	...	...
XVIII		Strathconan [Beauly] ...	2·11	— 2·60	·50	11	7	...	...	...	...
,,		Glencarron Lodge...	3·54	...	·61	14	15	51·6	24	24·0	2
XIX.		Dunrobin ...	1·55	— ·54	·41	17	10	51·2	12	28·0	20
,,		S. Ronaldshay (Roeberry) ...	1·51	— 1·13	·37	13	17	49·0	28	27·0	4, 5
XX.	IRELAND.	Darrynane Abbey...	5·69	...	·80	16	18	...	...	...	...
,,		Waterford (Brook Lodge) ...	4·53	+ ·45	·64	20	16	54·0	10	28·0	3
,,		Broadford (Hurdlestown) ...	2·50	...	·38	12	16	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	2·43	— ·65	·34	11	15	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·17	— ·18	·49	20	15	56·0	9	29·0	27
XXII.		Ballinasloe	3·29	+ ·51	·54	11	17	52·0	28	25·0	3
,,		Clifden (Kylemore)	6·30	...	1·06	16	14	...	...	...	...
XXIII		Waringstown ...	3·00	+ ·55	·48	17	18	56·0	12	22·0	2
,,		Londonderry (Creggan Res.).	1·92	— 1·11	·42	9	17	...	...	...	...
,,		Omagh (Edenfel) ...	3·19	+ ·50	·55	9	15	51·0	...	25·0	...

+ Shows that the fall was above the average ; — that it was below it.
a—and 14, 24. *b*—and 23. *c*—and 28.

METEOROLOGICAL NOTES ON FEBRUARY, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The first few days were cold, followed by 2·48 in. of R in the wet period, 4th to 15th, during which the springs rose at last and ponds filled up. Very warm from 8th to 14th and much wind, especially on 11th and 12th from S.W. The nights were very cold in the latter half of the month, and the wind generally E. Duration of sunshine 115 hours, of which 70 were in the last 8 days. Min. temp. in shade on 28th the lowest for four years. Thick rime on trees on 28th.

HARTLEY WINTNEY.—A Janus-like month—one face wet, the other dry. The rain which fell from the 4th to 15th was the greatest recorded here in any corresponding period. Gales of wind from S.W. and W. from 8th to 13th. From 16th to the end of the month, dry, calm and cloudless days, and sharp frosts from 22nd to 28th. Fogs on 5th, 19th, 20th, 26th and 27th. Ozone on 10 days. L on 11th, 12th and 13th. Lunar halo on 23rd. Brimstone butterfly on the wing on 16th.

ADDINGTON.—Between the 4th and 15th there was much rain and frequent high wind, then dry weather until the end. Very sharp frost on the 4th, and again on 26th, 27th and 28th. T to N. on 7th. The last six days very clear, with bright sunshine. S on 4th, 5th and 6th. Fog on 15th, 18th, 19th, 25th and 28th.

BURY ST. EDMUNDS, WESTLEY.—Dull to the 15th, then very fine. Very cold mornings from 22nd to end of the month, with much sunshine. Distant T on 7th. Fog on 23rd.

NORWICH, BRUNDALL.—S on 2nd, 3rd, 6th, and covering the ground on 4th. Fog on 4th, 17th and 18th. L in evening on 7th. Gales from S. on 8th, S.W. on 11th and 12th. The 10th was the warmest day ever registered so early in the year, but on February 28th, 1891, 64°·0 was recorded.

WINTERBOURNE STEEPLETON.—After a short spell of dry weather, heavy R fell between the 4th and 15th, filling up the springs to the full. The Winterbourne stream is running strongly, and a well by the side of the road about 1½ miles lower down is (March 3rd) still running over. The first five nights were cold, and again from the 21st we had continuous frosts on grass, and also in shade, except on the 24th, when 33° was registered. Mean temp. 41°·7. S on 4th. T on 7th and 13th. L on 12th and 13th. Fog on 17th and 18th.

TORQUAY, CARY GREEN.—R 3·24 in. above the average. Mean temp. 45°·6, or 2°·3 above the average. Duration of sunshine 94 hours, being 15 hours 35 minutes above the average; 8 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The first half of the month was particularly stormy and wet, with high temp.; the latter half quite the reverse. Gales from S. on 8th and 9th, and S.S.W. on 13th. L on 8th. L and H on 13th.

STROUD, UPFIELD.—S on 4th. T and L on 7th, 8th and 13th. S.W. gales on 9th and 13th.

WOOLSTASTON.—The early part of the month was wet, cold and stormy, S falling lightly on 4 days. The last week was again very cold, but dry. Mean temp. 39°·6. Vivid L, with T and H, on the 8th.

BOSTON.—Rainfall again deficient, and the water in the river has not risen this winter to half the height that it usually does after heavy rains. TSS on 7th and 13th. The max. temp. (62°·0 on 10th) is the highest on record for this month.

HESLEY HALL [TICKHILL].—Heavy TS 10 to 10.30 p.m. on 8th.

BREADSALL PRIORY.—Mild and wet during the earlier part of the month, followed by fine weather with cold nights and warm days.

SEATHWAITE.—S 4½ inches deep at 9 a.m. on 6th.

WALES.

HAVERFORDWEST.—The cold weather of January continued till the 4th, followed by stormy, wet, and very disturbed weather, especially from the 6th to the 13th, and the high tide with the excessive R at the period of new moon occasioned inundations not exceeded during 30 years. At 3 p.m. on the 13th a sharp but short TS occurred, the L being very vivid, and the T following quickly. After the 20th a complete change took place, the wind blew from the E., and very sharp frost with clear sky prevailed.

GOGERDDAN.—The last ten days were very bright, with sharp frosts at night.

SCOTLAND.

CARGEN [DUMFRIES].—Normal conditions on the whole characterized the month, the mean of the readings of the bar. and ther., and the records of rainfall and sunshine closely approximating to the average of 40 years. From the 1st to 7th inclusive a mean temp. of 32°·9 was registered, the min. being below freezing-point each day; higher mean temp. then occurred until the 22nd, when frost was again recorded, continuing during the last seven nights. Upwards of 4 inches of R fell in the nine days, 6th to 14th; but on 19th fine bright weather set in, continuing until the end of the month. Three inches of S fell on 6th. A severe TS occurred on 7th. E. winds prevailed on 20 days.

EDINBURGH, BLACKET PLACE.—Mean temp. 1°·2 above average; pressure and bright sunshine normal; rain slightly below the average. S from 2 to 3 p.m. on 5th and early on 7th. Solar halo on 9th. Aurora on 12th. Lunar halo on 23rd. Dense mist all day with silver thaw at night on 26th.

COLMONELL.—R ·75 in. below, and mean temp. 2°·2 above, the average of 22 years. S on 5th, 1½ inches deep. Gale on 17th.

TIGHNABRUAICH.—In every respect a normal month. S on 6th.

ABERDEEN, CRANFORD.—The month was cold and wet, with sharp frost and very little S. Wind for the most part S.W. and W. Very little sunshine.

S. RONALDSHAY, ROEBERRY.—A very fair month upon the whole. Mean temp. 38°·7, or 0°·2 above the average.

IRELAND.

DARRYNANE ABBEY.—The first fortnight was very mild and wet, with unusually high tides from 10th to 14th. The last few days were very fine.

WATERFORD, BROOK LODGE.—Remarkably high tides on 12th. H showers on 13th. Fog on 17th, 18th and 19th. E. winds from 20th to 26th.

BROADFORD, HURDLESTOWN.—Rainfall ·72 in. above, and number of rainy days one below, the average for 14 years. A favourable month on the whole. S.E. gale on 5th and 6th. Distant T on 7th.

DUBLIN, FITZWILLIAM SQUARE.—Stormy and wet during the first half of the month; the weather then became fine, dry and seasonable, with a remarkably large diurnal range of temp. Mean temp. 44°·0 or 1°·2 above the average. Fog on 7 days; high winds on 12 days, reaching the force of a gale on 6th, 9th, 10th, 13th and 14th. Lunar halos on 4th and 6th. S or sleet and hail fell on the 2nd; L was seen on the 8th and 9th.

OMAGH, EDENFEL.—For the first fortnight the weather was very wet and unsettled, the third week somewhat less so; but from the 21st to the end there followed a very fine dry period, with but little frost—highly favourable for all agricultural operations.

No. CCCXCIX.]
VOL. XXXIV.

[PRICE FOURPENCE.
Or 5s. per annum post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE
Winter Minima on British Mountain Tops	33
Negretti and Zambra's Self-Recording Rain Gauge	36
Royal Meteorological Society	38
Dr. Hellmann's Rainfall Map of Silesia	39
The Post Office in 1876 and 1898	41
Climatological Table for the British Empire, October, 1898 ...	43
Results of Meteorological Observations at Camden Square during March for 40 Years, 1858-97	44
Supplementary Table of Rainfall, March, 1899	45
Rainfall and Temperature in March, 1899, at 50 Stations	46
Meteorological Notes on March, 1899	47

APRIL, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, KNIGHTON ROAD, S.W.

THE OBSERVATO

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A.

Contains full Reports of the Meetings of the Royal Astronom
Meteorological Societies, and of the British Astronomical Assoc
by various eminent Astronomers, English, American, an
Correspondence on topics of interest connected with the Scien
Observatories, Publications and current Discoveries. Notes
Variable Stars, on Lunar Formations, etc., also are supplied fr
and direction of observers.

The Observatory was founded in 1877, and has become an established
Publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "T
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly

NOTICES.

It is requested that all Books for Review, and Com
the Editor be addressed to 62, Camden Square, London,
The responsibility for all facts and opinions ex
letters published in this Magazine rests with their respec

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

CCCXCIX.] APRIL, 1899. [PRICE FOURPENCE, *or 5s. per ann. post free.*

WINTER MINIMA ON BRITISH MOUNTAIN TOPS.*

ON May 13th, 1867, the late Mr. H. B. Biden placed a minimum thermometer at the altitude of 3,262 ft. on Y Glyder fach, a rough, stone-covered summit, about 4 miles E.N.E. of Snowdon. It was placed amid a chaos of large angular stones, beneath a protecting slab of feldspar porphyry, duly set, and left to its fate. For nearly 20 years Mr. Biden climbed up each spring, read and recorded the minimum of the previous winter, and reset the instrument. The site was too rough to tempt the ordinary tourist, but at last the repeated visits of nail-clad boots left a track of scratches, and finally, in 1895, some silly tourist found the thermometer and spoiled the record for 1894–95. Since then another spot has been selected, and there are now two thermometers on that lone top, where we hope that no unauthorized person will ever find them.

After Mr. Biden became unable to climb, and since his death, we believe that all the work has been done by Mr. Piffe Brown, of Gloucester, who read a short paper upon the subject a few years since.—(*Q. Jour. R. Met. Soc.*, xix. (1893), p. 149.)

He has recast the story, added comparative records, and completed the tables down to date in the article mentioned below, and (owing to its unique character) we think that the principal table should be quoted for general information—we have added the last two columns and a line of averages.

* W. Piffe Brown "On the Glyder thermometers and winter temperature on mountain summits" in *The Climbers' Club Journal*, February, 1899.

Winter Minima.

Year.	WALES. Glyder fach, 3,262 ft.	Church-stoke, 540 ft.	Llandudno 90 ft.	SCOTLAND. Ben Nevis, 4,407 ft.	Fort William, 35 ft.	Difference
	°	°	°	°	°	°
1867-68	14·5	...	...	...	...	...
1868-69 }						
1869-70 }	14·0	...	...	...	...	...
1870-71 }						
1871-72	14·0	...	...	...	...	...
1872-73	13·0	...	...	...	...	...
1873-74	14·0	..	...	...	...	...
1874-75	18·0	...	...	...	...	...
1875-76	15·0	15·7	22·9	...	...	...
1876-77	26·0	22·8	26·3	...	...	...
1877-78	17·0	23·5	28·0	...	...	...
1878-79	22·0	12·2	19·1	...	...	...
1879-80	15·5	13·2	23·0	...	...	...
1880-81	12·0	—1·0	14·5	...	...	...
1881-82	21·5	22·1	30·2	...	...	...
1882-83	16·0	10·7	25·5	...	...	...
1883-84	20·0	20·3	30·0	9·9 Feb., 1884	...	...
1884-85	26·0	21·8	27·0	11·1 Feb., 1885	18·9	7·8
1885-86	17·5	13·2	22·5	8·4 Dec., 1885	17·0	8·6
1886-87	18·0	14·7	24·5	8·4 Dec., 1886	14·0	5·6
1887-88	15·7	17·6	25·7	7·2 Mar., 1888	21·2	14·0
1888-89	15·0	14·4	25·5	6·4 Feb., 1889	15·7	9·3
1889-90	15·0	16·5	25·4	10·1 Mar., 1890	21·2	11·1
1890-91	11·0	9·2	20·0	5·6 Mar., 1891	17·2	11·6
1891-92	9·0	8·9	22·6	3·5 Mar., 1892	11·8	8·3
1892-93	10·0	11·2	25·0	6·4 Jan., 1893	13·9	7·5
1893-94	8·0	10·0	15·0	0·7 Jan., 1894	13·9	13·2
1894-95	No record	—5·0	17·5	1·8 Feb., 1895	8·9	7·1
1895-96	17·0	19·0	26·8	14·2 Jan., 1896	24·9	10·7
1896-97	15·0	19·0	26·0	4·0 Jan., 1897	...	...
1897-98	19·0	22·2	28·0	9·6 Feb., 1898	...	...
Averages—						
1867-98	16·0	...	...	...	...	...
1875-98	16·4	14·4	23·9	...	...	...
1883-98	15·4	14·2	24·1	7·1	...	...
1884-96(—94-5)	14·7	14·2	23·6	7·5	17·3	9·8

Mr. Piffe Brown was evidently surprised to find that the minima were not lower, and suggests that occasionally it may be due to an accumulation of snow covering the rocks and the thermometer, and so keeping it warm; but he points out, quite rightly, that it is improbable that there is *always* snow there at times of severe cold, and that if the high average is due to snow, the differences between the high and the low level minima ought to be very irregular, which, during the last 24 years, they are not.

There are, however, other points to mention. Mr. Brown has wisely brought into the table the only other record kept synchronously at an equal or greater height in the British Isles—Ben Nevis, at 4,407 ft. But with Ben Nevis it is necessary to compare some low level station in its immediate vicinity, and we have tabulated the figures for Fort William, corresponding with the dates of the summit minima. Here, on the 12-year mean, we get an average *decrease* for elevation of 9°·3.

There were, in 1866, thermometers at the hut on Snowdon, but they were of poor quality, and we never saw the records of their indications.

The only other high-level readings in the British Isles which we remember, were those made by Dr. J. F. Miller, F.R.S., on Sca Fell Pike, respecting which we reprint his account from the *Phil. Trans.* for 1849 and subsequent years.

"*Temperature on Sca Fell.*—Last summer I stationed a pair of Rutherford's self-registering thermometers (previously compared with a standard) on the top of Sca Fell Pike; they are suspended in a deal box, having the sides and base riddled with small circular holes, so that the instruments are freely exposed to the air, and at the same time thoroughly protected from the effects of terrestrial radiation. On the summit of the Pike is a cairn, or large pile of stones, about 8 ft. in height, having a stout pole in the centre, which projects about 2 ft. above the top of the pile. To this pole the box containing the thermometers is firmly fixed.

"From the maximum thermometer I have never been able to obtain any correct readings, as, from some cause, the steel needle is always found at the extreme end of the stem, furthest from the bulb. I cannot account for this, unless, indeed, the fine steel needle is affected by electrical currents at such an extreme height in the clouds. The readings of the maximum thermometer would, however, have probably been of little value, as it would be almost impossible to protect it from the effect of solar radiation.

"The following are the readings of the minimum thermometer for each month from July to the end of the year 1848:—

"July, 22°; August, 24°; September, 18°; October, —6°; November, —6°; December, —9°, or 41° below the freezing point of water.*

"The lowest extreme in these months, in the Vale of Borrowdale, at 4 ft. above the ground was as under:—

"July, 45°; August, 41°·5; September, 38°·5; October, 29°·5; November, 24°; December, 26°."

In his report for 1849, Dr. Miller said:—

"I regret that my endeavours to obtain the monthly extremes of temperature on the summit of Sca Fell Pike have hitherto failed.

* On the 29th and 31st of January, 1849, the box containing the thermometers was so thickly encased in ice that it could not be opened. The minimum temperature for the month was read off on the 12th of February, being no less than 34° below the zero point of Fahrenheit's scale. This unheard of extreme of cold undoubtedly occurred on the night between the 2nd and 3rd of January, when a naked thermometer on grass, at Whitehaven, fell to +4°, and one on raw wool to —2°·8. J. F. M.

"The indications for 1849 are apparently so erroneous, that I cannot place any dependence upon them. The instruments are slightly inclined in the box, which is riddled with small circular holes, and it is supposed that strong currents of air passing through them have shaken the thermometers, and caused the indices to descend in the tubes. The instruments are now fastened in the case, and I hope to secure correct readings during the current year."

Finally, in the report for 1850, we have the following statement, with no indication of doubt as to the accuracy of the record:—

"The records of the self-registering minimum thermometer on Sca Fell, in 1850, are as under:—

"January and February, 31° below zero; March, 10° below zero; April, 10° below zero; May, 14°; June, 22°; July, observation lost; August, 9°; September, 7°; October, 7°; November and December, 15° below zero.

"In the valley, the minima at 4 ft. from the ground were: in January, 19°; February, 29°; March, 21°; April, 32°; May, 30°; June, 42°; July, 43°; August, 39°·5; September, 39°; October, 27°; November, 20°·5; and December, 22°.

"I have recently planted a minimum thermometer on the Gabel, and also one near Sprinkling Tarn, at the respective heights above the sea of 2,928 and 1,900 ft., and hope, in future, to obtain regular monthly readings at all the three stations."

We have copied these wonderful temperatures verbatim, instead of putting them in their proper form of "—31°," &c., because Dr. Miller, having used the words "below zero," seems to have desired to exclude all doubt as to the fact.

We do not think that it would be easy to produce evidence more contradictory than that from Glyder fach and from Sca Fell, or a clearer proof of the difficulty of the investigation, and of the desirability of renewed efforts to ascertain the facts.

NEGRETTI AND ZAMBRA'S SELF-RECORDING RAIN GAUGE.

IT is long since we have seen so simple and yet so efficient an instrument as this.

As a standard for determining the total fall of rain no one detests Crosley's and all mechanical gauges more heartily than we do. We saw with regret that a modified Crosley, with a pretty face, had been brought out. We were sure that it would fail, and have already heard of its having done so. How is it then that holding these views we can approve of this, which is also a modified Crosley?—(1) Because in this pattern every part is visible and easily accessible; (2) Because the two chief faults of a Crosley as a standard instrument, even when in good order, are unimportant in a recording one—viz., (*a*) the loss by evaporation from the bucket of (on the average) half of once its capacity, *i.e.*, with the gauge before us, of ·005 in.; (*b*) the loss during a torrential rain of what falls during the tip.

We have always held that the very best recorder should have an ordinary gauge by its side. We trust the recorders for the distribution of the fall in time and amount; but we take the real total from an ordinary gauge.

Now a brief description of the new pattern. The rain collected by the receiver passes down and falls into the upper half of the vibrating bucket (designed by Sir Christopher Wren). When ·01 in. has fallen, the weight of the water tips the bucket over, and sends the water down one of the ear-trumpet-like shoots. In tipping it falls on and drives down the vertical rod, which, being rigidly connected with the escapement, it advances the wheel one tooth. Attached to the wheel is a helix, on which rests the lever carrying the pen, and thus each ·01 in. raises the pen slightly 0·028 in. As the clock (the useful invention of MM. Richard) is turning the paper about ·001 in. per minute, a very clear curve is produced.

The proportions which we have just quoted, *i.e.*, 1 in. of rain represented by 2·8 ins. of paper, and 24 hours represented by 1·6 ins. of paper, are those adopted in the instrument which Messrs. Negretti sent to us for trial. It is obvious that by varying the size of the buckets and of the funnel and the length of the lever, any scale desired can be obtained. No recorder is known to us which will give minute details of thunderstorm rain, such as would stand high in the list of Heavy Rains in Short Periods in *British Rainfall*. Take, for instance, the first case in *British Rainfall*, 1897, viz., ·19 in. in 3 minutes, *i.e.*,

·01 in. in 10 seconds. There are 86,400 seconds in a day; how many yards of paper would be accumulated daily and yearly if the gauge were required to show every hundredth in the rare case of such a fall as that? It could be done, but no one would like the trouble or the cost of doing it. The scale adopted by Messrs. Negretti & Zambra seems to us a reasonable one; in all ordinary cases, every hundredth of an inch can be read off, and unless the fall exceeds two inches an hour we do not think that there will be the least difficulty in reading off the details.

We hope to place one at Seathwaite, which fact will probably be the best indication of our opinion as to its suitability.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, March 15th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

Messrs. T. W. Rundell and J. R. Williams, M.B., were elected Fellows.

THE DROUGHT OF 1897–8.

Mr. F. J. Brodie read a paper on "The prolonged deficiency of Rain in 1897 and 1898." For several years past there has existed over England, and especially over the central and south-eastern parts of the country, a remarkable tendency in favour of dry weather. Consequently the dry weather dealt with in this paper came at a very inopportune time, and its effects, which would in any case have been sufficiently evident, were greatly aggravated by the antecedent conditions. Mr. Brodie discussed the rainfall records at 80 stations distributed over the British Isles for the 18 months, April, 1897, to September, 1898; these were divided into three periods of six months each.

During the period April to September, 1897, the rainfall was in excess of the average over practically the whole of Ireland, the greater part of Scotland, and the north-west and south-west of England and Wales, while in the north of Scotland, and the central and the whole of the eastern part of England, there was a deficiency, in some parts amounting to between 60 and 70 per cent.

During the period October, 1897, to March, 1898, with the exception of the north-west of Scotland and of England, the rainfall was below the average all over the British Isles, the deficiency over the midland and south-eastern parts of England being from 50 to 60 per cent.

During the period April to September, 1898, two of the six months were exceedingly dry, and in the southern parts of England at least two others had a deficiency of rainfall.

Taking the 18 months, the rainfall over the eastern, midland and southern counties was deficient by about 20 per cent. and in the

south-eastern counties more than 40 per cent., the greatest deficiency being 49 per cent. in London. From an examination of the Greenwich rainfall records since 1841, it appears evident that for length and severity combined, the recent spell of dry weather was the most remarkable experienced there during that period.

A paper on the "Climate of Jersey," by the Rev. H. W. Yorke, M.A., was read by the Secretary. The situation and geological formation of the island, together with the action of the tides, have a great local effect on the general character of the weather. The climate as a whole is bright, genial and sunny.

DR. HELLMANN'S RAINFALL MAP OF SILESIA.

To the Editor of the Meteorological Magazine.

SIR,—I cannot agree with the principles about the construction of maps of rainfall laid down in your review of my *Regenkarte der Provinz Schlesien* (p. 23 of last number).

I am of the opinion that such a map, and indeed all physical maps, should be as clear and as expressive as possible. The topographical details of this class of maps will, therefore, entirely depend upon their scale and special scope.

You suggest the indication of the positions of the 300 stations by small black dots. This could have been done in my map, the scale of which is 1:1250000, for all the stations in the plain—not without obscuring the map, as you suppose—but it would be quite impossible in the mountainous districts, *i.e.*, just in that part where the deepest shades of colour are to be found. In the Giant Mountains there are about 35 stations. If you would put these dot by dot, that part of the map would become one large dark spot and quite illegible.

Your reference to the map of rainfall in the Lake District (*British Rainfall*, 1897,) seems to me not strictly parallel, it being a special map of large scale which contains only isohyets but not shades of colour.

What you desire, the position of all stations and the true mean printed over the site of each station, you can find in a map of rainfall of Silesia, based on observations of five years, and published by Professor Partsch in 1895, the scale of which is larger (1:1000000) than that of mine. Please compare the two maps. I am sure that you will not hesitate a moment in deciding which is clearer and more expressive.

Your second suggestion—viz., to print an outline map in which the position of each station is marked with a number corresponding to the printed table—seems to me much more acceptable. I did not do so because I desired to keep down the cost of the map. In publishing the pamphlet—similar ones for the other Prussian provinces are in preparation—it was my aim to offer to the public interested in rainfall work, especially to the farmer and to the engineer, reliable information, in text and in map, of the various

details of the rainfall of his province at a reasonable price. And I hope that I have not failed in this respect; for a pamphlet, royal 8vo, 24 pp., and a coloured map, at the price of *one mark*, is, I think, all that could be desired.

If anyone doubts the exactness of the curves on the map, he has the data wherewith to test them; for the letterpress contains all facts on which they are based, and a large atlas or a special map of Silesia affords the position of the stations.

Lastly, I beg to correct a misunderstanding in the review. Not the "Royal Meteorological Institute of Silesia" has distributed rain gauges to various persons in that province, but the Royal Meteorological Institute of Prussia has done that in Silesia (as well as in the other provinces).—Yours faithfully,

G. HELLMANN.

Reference to our Review will show how favourably we spoke of Dr. Hellmann's work; but as regards the points raised by his letter, we see no reason to alter a word which we wrote, except in as far as additional information is afforded by Dr. Hellmann himself.

In the third paragraph, Dr. Hellmann objects to our suggestion of marking the stations by black dots. A dot 1 mm. square would be amply large. The map occupies nearly 60,000 sq. mm., but as the country is irregular in shape, and there is much margin, we may say that the real area is 30,000 sq. mm.; and as there are 300 stations, evidently if the stations were equably distributed, each mm. dot would have 99 clear mm. around it. But it now appears that the stations are not at all equably distributed, which is just the fact which we wanted to elicit, and we admit that 35 black spots could not be shown on the dark shaded area. We doubt whether they could be shown individually unless the map were on a larger scale.

We have not seen Prof. Partsch's map, but as to Dr. Hellmann's, we wrote: "the coloured map (which is excellent)" . . . What more could we have said?

On the pamphlet which we reviewed there is no reference to price. We thought that it was an official publication, and then, in most countries, the cost does not matter. It is certainly a wonderful shilling's worth. They will have to sell a large edition to pay even the cost of paper and printing.

We did not in the least doubt the accuracy of the curves, but we thought, and think, that some map indicative of the geographical distribution of the stations would add to the value of the paper.

We fully admit the error mentioned in the last paragraph of Dr. Hellmann's interesting letter, but in palliation we reprint the two lines which led to the mistake:—"Im laufe des Sommers 1887 wurde vom Königlichen Meteorologischen Institut in der Provinz Schlesien, &c.' The sentence runs on for five lines, and of course we ought not to have made the mistake, but the word "Preussischen" is omitted—taken for granted, and the absence of a comma after the word "Institut," caused our fall.—ED.

THE POST OFFICE IN 1876 AND IN 1898.

To the Editor of "The Times."

SIR,—When the chiefs of a Government department reverse the decisions of their predecessors in office, and inflict fines upon the public for persisting in the course approved by their predecessors, and when, moreover, on their attention being called to it they refuse either apology or redress, there are three courses open to the aggrieved party. (1) He can put up with it; (2) he can bring an action, but even if he wins he will probably be out of pocket; (3) he can try to enlist the attention of the Press, the public, and Parliament.

I hope that, not for my sake but for the public benefit, as you will see later on, you will allow me to state my case.

About thirty years ago I prepared, for the use of rainfall observers, the form* respecting which the present Post Office officials have reversed the decision of their predecessors, and of which I enclose one taxed as being "of the nature of a letter."

Neither I nor any of my correspondents had the slightest doubt that such a document was entitled to go at the halfpenny rate. Tens of thousands of them did so go, and eventually the question was proved, for in 1876 several of them were taxed. I wrote to the Post Office, they apologized, said that it had been done in error, and should not occur again.

Subsequently, occasionally, if one was taxed I sent it to the Secretary, the taxation was cancelled, the penny was refunded, and I had to sign a receipt for the amount. Doubtless the Post Office hold these receipts, as I hold specimens of the forms with the taxation cancelled by their own officials.

Last autumn, however, when Parliament was not sitting, and most persons were out of town, the Office suddenly changed its mind and has been taxing me 10s. or 15s. a month ever since.

I thought that it was better not to take any action until the principal officers were in town, and then I sent in a memorandum with the necessary documentary evidence as to the change of front.

The result was that the present officials ignored the action of their predecessors, refused any apology or redress, and are so energetic in having all documents coming to me examined and taxed that they recently taxed one bearing the full letter postage. I am keeping it with other postal curios.

The London officials have not yet converted the chiefs of the colonial post offices, and so we have now the further amusing complication that returns coming to me from the colonies and passed by the colonial offices as sufficiently paid are being taxed 3d. each by the London authorities. Whether they send the 3d. to the colony concerned I do not know, but, from my personal knowledge of one of the colonial Postmasters-General, I think that St. Martin's-le-Grand will regret interfering with colonial rights.

* The monthly rainfall forms on which returns are received for the tables in his Magazine.

Of course, I am aware that if I chose to have the information sent to me on a card, instead of on a sheet of paper, the officials would be quite happy; but I do not see why what was right in 1876 was wrong in 1898.

I said that my object in writing is not merely personal, and I wish in conclusion to enquire whether the halfpenny rate is not capable of reduction to common sense.

At present a tradesman sends me an invoice with description and price of goods; that is not "of the nature of a letter." A scientific friend sends me a string of figures without a word of explanation; that is "of the nature of a letter."

What is the money value of the time spent by officials in opening and investigating documents coming to me I do not know, but I cannot see why all this inquisitorial business should not be abolished by the adoption of a common-sense rule which does not pretend to discriminate between commercial and scientific figures, and which is in accordance with what was until lately the practice of the Post Office.

I am, Sir, your obedient servant,

G. J. SYMONS, F.R.S.

62, Camden Square, N.W., March 24th.

[We should not have thought of reprinting the above letter in these pages had it concerned ourselves alone. If no member of either House of Parliament takes the matter up, and if the Post Office is allowed at its own sweet will to declare the same practice at one time correct and at another time incorrect, the responsibility rests not with us but with our rulers. We can either pay the fines or change our forms; but if such practices are to be condoned, a new work is wanted with the late Albany de Fonblanque's title lengthened, "How we are governed [in 1899]." Even that, however, would not justify our devoting space to the subject; but if our correspondents are to be so severely dealt with, it is well that they should know it.—ED.]

REMARKS (*continued from p. 43*).

Adelaide.—Mean temp. 1°·7 above, and rainfall ·13 in. above, the average for 41 years. C. TODD, F.R.S.

Sydney.—Temp. 2°·3 above, humidity 1°·9 below, and rainfall ·36 in. above, the average. H. C. RUSSELL, F.R.S.

Wellington.—The early part generally stormy from N.W., with light rain at intervals; fine in the middle; showery with stormy N.W. wind towards the end. L and T on 4th. Snow on hills on 5th. Rainfall 1·52 in. below average. R. B. GORE.

Auckland.—Stormy and showery, with prevalence of S.W. winds, and occasional T. Rainfall 1·25 in. above, and mean temp. nearly 1° below, the average for 30 years. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 1·86 in. below the average for 30 years. J. H. HART.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	71·1	3	40·2	2	60·6	49·0	49·8	86	106·1	33·6	2·96	13	7·0
Malta	84·9	17	55·9	21	76·3	65·4	62·2	75	143·6	55·0	7·78	8	2·7
Cape of Good Hope	79·4	15	44·7	28	67·5	52·2	51·0	76	...	...	2·51	10	2·5
Mauritius	81·0	18*a*	60·0	11	78·7	65·5	61·6	73	134·3	52·6	·53	8	5·0
Calcutta	91·2	3	63·1	29	85·6	72·7	71·4	77	155·7	55·0	6·43	6	4·3
Bombay	94·2	23	76·0	2	90·1	78·2	75·3	75	137·3	66·9	·48	5	2·0
Ceylon, Colombo	90·0	21	72·0	31	86·2	75·0	72·5	83	152·0	71·5	20·60	25	6·9
Melbourne	89·0	26	38·2	5	70·5	49·8	44·5	61	143·1	27·9	1·21	11	5·4
Adelaide	90·7	16	41·8	28	75·9	51·5	45·8	54	152·0	33·2	1·91	10	4·3
Sydney	99·7	19	48·9	2	74·4	57·1	53·7	66	147·1	38·3	3·19	13	3·6
Wellington	75·0	26	37·0	6	60·8	47·7	44·1	69	130·0	25·0	2·85	12	4·1
Auckland	65·0	29	47·5	2, 6	61·2	51·2	47·9	73	130·0	43·0	4·68	19	6·4
Jamaica, Kingston	92·1	4	69·7	11	86·4	73·0	71·6	79	...	...	9·77	17	...
Trinidad	92·0	18	68·0	26	87·9	68·0	71·4	80	167·0	68·0	6·15	20	...
Grenada	86·0	2	71·4	26	83·9	75·2	72·0	77	154·0	...	7·74	24	3·0
Toronto	82·0	3	26·6	28	58·5	43·4	46·5	82	98·8	22·0	5·77	16	6·5
New Brunswick, Fredericton	80·9	4	21·4	19	56·2	37·7	36·5	67	...	...	7·25	13	5·6
Manitoba, Winnipeg	65·8	2	19·0	30	45·0	30·5	...	...	...	...	5·67	16	7·3
British Columbia, Esquimalt	61·1	7	36·0	15	55·8	43·6	..	...	...	...	3·14	12	6·9

a—and 24.

REMARKS.

MALTA.—Adopted mean temp. 69°·6, or 0°·3 above average. Mean hourly velocity of wind 9·2 miles, or 0·2 above average. Mean temp. of sea 75°·3. L on 6 days. At 2 p.m. on 19th a cyclonic TS precipitated hailstones the size of hens' eggs, many measured 2¼ inches in longest diameter. In other parts of the island they crashed through wooden venetians, and pierced corrugated iron roofing. A friend assures me that one mass of ice which fell, an agglomeration of walnut sized masses, congealed together, weighed just over two pounds. Nearly 300 panes of glass were destroyed in this College, and it is estimated that over 1,000,000 panes were destroyed in Valletta and suburbs. The storm centre passed over from N.W. to S.E., the wind gusts being of hurricane force, throwing down walls and uprooting trees. Most of the war ships in harbour were completely stripped of their awnings. A massive stone wall, flanking the botanical gardens at Floriano, was thrown down, for a length of 300 feet. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, of dew point 0°·2, and rainfall 1·04 in., below their respective averages. Mean hourly velocity of wind 10·3 miles, or 0·8 below average; extremes, 24·9 on 2nd and 0·0 on 8th, 23rd, and 24th; prevailing direction S.E. by E. to E. by N. The rainfall is the least on record in 24 years, excepting 1878, when ·46 in. fell on 3 days. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 0°·1 below, of dew point 0°·4 above, and rainfall 6·24 in. above, the average. Mean hourly velocity of wind 7·5 miles; prevailing direction S.W. and W. L on 7 days. H. O. BARNARD.

(*Continued on p. 42.*)

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

MARCH.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry Mean, 9a.&9p.	Wet Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	·69	5	·37	0	42·0	39·3	70·1	51·1	24·5	35·0	..	..	..	..	3·8
1859..	1·33	12	·40	0	45·9	43·3	62·6	53·5	27·8	39·9	..	..	..	..	6·4
1860..	1·87	17	·24	0	40·9	38·7	57·8	48·3	25·8	35·4	..	..	23·8	33·2	6·1
1861..	2·43	17	·39	0	43·7	41·1	62·7	52·7	27·8	36·9	..	..	19·9	32·8	5·4
1862..	3·69	20	·86	0	43·5	42·2	62·5	50·0	21·3	37·9	..	..	16·6	35·4	8·1
1863..	·85	9	·22	0	43·4	41·1	65·0	53·5	26·9	35·9	..	..	20·7	30·3	4·8
1864..	2·62	15	·53	0	41·0	39·2	60·5	50·3	26·4	34·6	..	..	19·4	31·8	6·6
1865..	1·12	15	·24	0	36·5	34·8	57·8	45·0	23·2	31·7	..	..	19·2	28·0	6·4
1866..	1·69	17	·40	0	40·8	38·7	65·2	48·9	22·5	35·1	..	..	14·2	29·5	5·9
1867..	2·48	21	·48	0	38·1	36·5	57·1	45·2	25·0	33·2	..	..	22·1	31·0	7·5
1868..	1·28	16	·44	0	44·7	42·2	60·5	53·0	29·2	37·4	..	..	24·4	33·9	6·0
1869..	1·97	16	·55	0	38·1	36·2	54·0	45·5	26·8	32·2	..	..	23·4	30·0	7·2
1870..	2·31	13	·95	0	40·0	37·8	60·5	48·3	23·8	35·5	101·5	80·0	20·8	32·3	7·4
1871..	1·19	12	·37	0	44·6	42·4	68·7	54·7	29·0	37·3	110·0	82·7	26·3	34·2	5·5
1872..	2·66	17	·69	0	44·8	42·8	61·1	53·5	26·1	37·9	101·2	84·1	23·1	34·6	6·1
1873..	1·46	17	·24	0	41·7	40·2	63·7	51·2	29·2	35·6	102·9	79·6	26·8	33·4	6·0
1874..	·39	12	·08	0	43·7	41·7	65·4	53·3	21·9	36·9	109·7	83·8	20·1	34·9	6·6
1875..	·69	11	·28	0	40·8	38·5	59·5	48·3	27·1	35·3	106·2	75·4	25·4	33·3	7·2
1876..	2·96	22	·74	0	41·2	39·1	63·3	48·9	26·4	35·2	104·2	84·0	19·2	31·2	5·4
1877..	2·38	20	·34	0	40·6	38·9	59·4	48·6	23·5	34·9	103·1	81·6	23·0	32·4	7·0
1878..	1·12	10	·50	0	42·1	39·2	58·0	51·0	26·4	36·3	99·2	86·2	19·3	31·8	6·6
1879..	·91	14	·14	0	40·5	38·8	63·1	49·4	29·2	34·8	107·1	78·7	27·4	32·4	6·1
1880..	·79	5	·31	0	43·4	41·3	62·6	54·4	28·7	37·0	111·2	91·3	22·7	32·3	6·0
1881..	2·30	11	·59	0	42·1	39·8	60·3	51·1	23·7	36·1	112·6	87·8	20·8	32·4	6·2
1882..	1·35	11	·67	0	45·0	42·9	63·9	55·5	28·5	38·1	128·7	91·4	25·2	34·0	5·1
1883..	·86	11	·29	0	35·9	34·1	57·0	44·9	22·4	30·4	101·4	81·0	19·3	27·8	5·4
1884..	1·41	7	·56	0	43·8	41·3	68·0	52·7	27·5	37·5	99·8	79·7	23·2	34·1	5·8
1885..	1·65	7	·74	0	39·7	37·1	62·6	49·4	26·5	33·0	105·9	78·7	21·5	28·0	5·4
1886..	1·38	14	·38	0	39·3	37·6	62·2	46·8	22·1	34·1	103·3	72·2	17·3	30·0	6·5
1887..	1·65	12	·37	0	37·4	35·8	57·5	45·8	22·4	32·2	100·4	74·4	17·4	28·4	6·1
1888..	3·34	20	·39	0	38·0	36·4	55·4	45·0	24·7	33·7	92·8	70·6	17·7	29·7	8·2
1889..	1·36	13	·37	0	40·5	38·1	59·6	48·2	19·2	33·8	98·8	77·6	16·4	29·5	7·0
1890..	1·76	14	·48	0	43·2	41·0	66·2	51·1	15·6	36·5	103·7	81·7	12·8	31·6	6·6
1891..	2·01	15	·55	0	40·1	37·7	57·7	47·8	23·7	34·6	101·1	79·4	18·0	30·0	6·4
1892..	1·04	9	·20	0	36·9	34·9	59·8	44·9	22·3	31·0	96·7	75·3	20·3	28·1	5·6
1893..	·32	6	·13	0	44·6	41·6	67·6	56·6	25·9	36·3	103·4	86·9	19·9	30·3	3·1
1894..	1·18	9	·40	0	43·3	40·9	65·8	54·2	28·6	36·0	108·8	88·0	22·1	29·5	4·4
1895..	1·42	14	·38	0	41·7	39·7	63·7	51·0	23·7	35·6	102·6	81·8	22·4	32·2	6·5
1896..	3·20	25	·53	0	45·7	43·4	65·2	53·3	29·4	39·9	103·2	80·5	24·9	34·4	6·9
1897..	3·42	17	·49	0	44·4	41·8	61·7	52·3	26·8	39·2	101·9	82·9	20·5	32·8	6·2
Mean ...	1·71	14	·43	0	41·6	39·5	61·9	50·2	25·3	35·5	104·3	81·3	21·0	31·6	6·1
Extremes	3·69	25	·95	0	45·9	43·4	70·1	56·6	29·4	39·9	128·7	91·4	27·4	35·4	8·2
	·32	5	·08	0	35·9	34·1	54·0	44·9	15·6	30·4	92·8	70·6	12·8	27·8	3·1

SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·38	XI.	Builth, Abergwesyn Vic.	3·27
II.	Dorking, Abinger Hall .	·67	,,	Rhayader, Nantgwillt ...	2·70
,,	Birchington, Thor	·88	,,	Lake Vyrnwy	2·97
,,	Hailsham	·95	,,	Corwen, Rhug	2·03
,,	Ryde, Thornbrough	·85	,,	Criccieth, Talarvor	2·04
,,	Emsworth, Redlands ...	·65	,,	I. of Man, Douglas	2·31
,,	Alton, Ashdell	1·11	XII.	Stoneykirk, Ardwell Ho.	2·04
III.	Oxford, Magdalen Col..	·25	,,	New Galloway, Glenlee	5·25
,,	Banbury, Bloxham	·55	,,	Monaive, Maxwelton Ho.	5·47
,,	Northampton, Sedgebrook	1·26	,,	Lilliesleaf, Riddell	2·92
,,	Stamford, Duddington..	·75	XIII.	N. Esk Res. [Penicuick]	3·25
,,	Alconbury	·54	XIV.	Glasgow, Queen's Park..	3·18
,,	Wisbech, Bank House...	·66	XV.	Inverary, Newtown	6·19
IV.	Southend	·78	,,	Ballachulish, Ardsheal...	7·68
,,	Harlow, Sheering..... ...	·60	,,	Islay, Gruinart School ...	2·60
,,	Colchester, Lexden	·86	XVI.	Dollar.....	3·46
,,	Rendlesham Hall	1·23	,,	Balquhidder, Stronvar...	7·06
,,	Scole Rectory	1·16	,,	Coupar Angus Station...	1·85
,,	Swaffham	1·16	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	·85	XVII.	Keith H.R.S.....	2·23
,,	Bishop's Cannings	·46	,,	Forres H.R.S.	2·58
,,	Blandford, Whatcombe .	·82	XVIII.	Fearn, Lower Pitkerrie..	2·46
,,	Ashburton, Holne Vic...	1·45	,,	S. Uist, Askernish	3·47
,,	Okehampton, Oaklands.	1·41	,,	Invergarry.....	4·82
,,	Hartland Abbey	·92	,,	Aviemore H.R.S.	...
,,	Lynton, Glenthorne ...	2·20	,,	Loch Ness, Drumnadrochit	2·63
,,	Probus, Lamellyn	1·37	XIX.	Invershin	2·64
,,	Wellington, The Avenue	1·05	,,	Durness	6·46
,,	North Cadbury Rectory	·38	,,	Watten H.R.S.....	1·66
VI.	Clifton, Pembroke Road	1·17	XX.	Dunmanway, Coolkelure	4·12
,,	Ross, The Graig	·63	,,	Cork, Wellesley Terrace	1·38
,,	Wem, Clive Vicarage ...	1·13	,,	Killarney, Woodlawn ..	4·69
,,	Wolverhampton, Tettenhall	·97	,,	Caher, Duneske	·93
,,	Cheadle, The Heath Ho.	1·76	,,	Ballingarry, Hazelfort...	1·08
,,	Coventry, Priory Row ..	1·40	,,	Limerick, Kilcornan ...	...
VII.	Grantham, Stainby	·73	,,	Miltown Malbay	2·06
,,	Horncastle, Bucknall ...	...	,,	Gorey, Courtown House	·89
,,	Worksop, Hodsck Priory	·83	XXI.	Moynalty, Westland ...	1·46
VIII.	Neston, Hinderton	·96	,,	Athlone, Twyford	1·63
,,	Southport, Hesketh Park	1·28	,,	Mullingar, Belvedere ...	1·57
,,	Chatburn, Middlewood.	2·93	,,	Woodlawn	1·95
,,	Duddon Val., Seathwaite Vic.	6·63	XXII.	Crossmolina, Enniscoe ..	4·12
IX.	Melmerby, Baldersby ...	1·24	,,	Collooney, Markree Obs.	2·35
,,	Scarborough, Observat'y	2·05	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·42	,,	Warrenpoint.....	1·61
X.	Haltwhistle, Unthank...	2·18	XXIII.	Seaforde..	1·53
,,	Bamburgh	1·83	,,	Belfast, Springfield	2·15
,,	Keswick, The Bank.....	3·55	,,	Bushmills, Dundarave..	2·25
XI.	Llanfrechfa Grange	1·82	,,	Stewartstown	2·49
,,	Llandovery	2·15	,,	Killybegs	5·35
,,	Castle Malgwyn	2·72	,,	Horn Head	2·96
,,	Brecknock, The Barracks	1·35	,,		

MARCH, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which '01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·50	— 1·11	·19	25	8	61·1	29	19·2	21	18	22
II.		Tenterden	·82	— ·97	·36	25	8	59·5	14	21·0	21	17	23
,,		Hartley Wintney	·76	...	·22	25	7	60·0	30	15·0	22	19	23
III.		Hitchin	·68	— ·66	·24	25	8	60·0	29	18·0	20	21	...
,,		Winslow (Addington)	·70	— 1·02	·19	8	9	62·0	29	14·0	22	20	22
IV.		Bury St. Edmunds (Westley)	1·23	— ·32	·40	25	10	58·0	29	15·0	22	...	...
,,		Norwich (Brundall)	1·99	...	·73	19	17	62·2	11	14·0	21	16	25
V.		Winterbourne Steepleton ...	·73	...	·27	8	12	60·2	15	16·5	23	16	25
,,		Torquay (Cary Green)	·76	...	·37	8	5	60·4	29	26·2	22	9	17
,,		Polapit Tamar [Launceston]..	1·51	— 1·02	·56	8	12	65·5	15	11·5	22	...	19
VI.		Stroud (Upfield)	·89	— 1·30	·50	8	8	60·0	13*a*	21·0	21	15	..
,,		ChurchStretton(Woolstaston)	1·38	— ·75	·53	25	11	62·5	16	21·0	23	11	21
,,		Worcester (Diglis Lock)	·47	— 1·31	·16	19	7	...	..	...	...	...	...
VII.		Boston	·73	— ·81	·25	30	9	62·0	11	20·0	21	15	...
,,		Hesley Hall [Tickhill].....	·91	— ·99	·34	30	12	61·0	13	20·0	21*f*	16	...
,,		Breadsall Priory	1·33	...	·40	25	14	60·0	14	18·0	21	15	26
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ..	1·10	— ·96	·48	30	9	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·49	— 1·61	·93	25	15	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·40	— ·65	·29	20	14	60·0	11*b*	19·0	21	14	21
X.		Newcastle (Town Moor)	1·35	— 1·28	·31	23	13	...	..	...	...	...	...
,,		Borrowdale (Seathwaite).....	9·38	— 1·12	2·91	25	17	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·67	— 1·21	·97	25	11	...	..	...	...	...	...
,,		Haverfordwest	2·38	— ·86	·96	25	13	62·8	15	22·1	24	12	21
,,		Aberystwith (Gogerddan) ...	1·67	— 1·31	·84	25	10	62·0	15*c*	...	...	...	...
,,		Llandudno.....	1·18	— ·90	·35	25	11	61·0	16*d*	26·0	24	6	..
XII.		Cargen [Dumfries]	4·84	+ 1·54	1·46	28	10	60·0	17	18·0	24	12	...
XIII.		Edinburgh (Blacket Place)...	2·13	...	·58	25	12	62·9	17	23·5	24	8	14
XIV.		Colmonell	2·91	...	·51	28	16	66·0	17	19·0	23	...	...
XV.		Tighnabruaich	4·81	...	·95	25	17	52·0	14*e*	23·0	21	10	...
,,		Mull (Quinish).....	5·55	+ 1·71	·92	28	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices	3·30	+ ·33	1·10	29	...	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·65	— ·75	·40	25	17	62·3	17	20·9	24	11	...
XVII.		Braemar	2·46	— ·18	·30	28	23	63·0	16	3·0	24	16	25
,,		Aberdeen (Cranford)	3·02	...	·65	20	22	60·0	14	14·0	23	16	...
,,		Cawdor (Budgate)	2·56	+ ·52	1·06	29	16	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·87	— 1·45	·56	7	10	...	...	..	...	...	...
,,		Glencarron Lodge.....	9·26	...	1·30	31	25	57·0	16	17·0	23	11	...
XIX.		Dunrobin	2·91	+ ·66	·46	28	21	57·0	14	22·0	24	17	...
,,		S. Ronaldshay (Roeberry) ...	2·54	·00	·56	31	26	52·0	16	23·0	21	14	...
XX.		Darrynane Abbey.....	2·11	...	·65	8	18	...	..	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·62	— 1·28	·43	28	10	64·0	31	22·0	24	9	...
,,		Broadford (Hurdlestown) ...	1·24	...	·38	8	16	..	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·21	— 1·16	·41	28	10	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	·91	— 1·10	·29	25	12	59·9	31	26·6	22	5	13
XXII.		Ballinasloe	1·94	— ·69	·47	25	17	60·0	16*d*	26·0	23	7	...
,,		Clifden (Kylemore)	5·02	...	1·22	24	17	...	...	...	...	...	...
XXIII		Waringstown	1·71	— ·64	·52	25	9	68·0	18	20·0	23*g*	12	17
,,		Londonderry (Creggan Res.).	2·50	— ·23	·46	25	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·35	— ·16	·80	25	16	64·0	16	22·0	22	11	14

+ Shows that the fall was above the average; — that it was below it.

a—and 29, 30. *b*—and 12. *c*—and 16. *d*—and 17. *e*—and 29. *f*—and 22. *g*—and 24.

METEOROLOGICAL NOTES ON MARCH, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The first dry March since 1893, and the coldest weather since February, 1895. Sunny days and cold nights continued half through the month, with very little wind. From 19th to 25th a very cold spell occurred; calceolarias were killed, and apparently bamboo which had stood three winters. Average max. temp. 49°·8, average min. in shade 32°·3, and on grass 27°·4. Duration of sunshine 185 hours, 30 mins. Grass min. 15°·0 on 25th. T on 4th. S on 20th, 21st and 24th.

HARTLEY WINTNEY.—A bitterly cold and dry month. The driest March since 1893. There were only 6 mornings without frost, which in the third week was exceedingly severe, with ice in shade all day long. The temp. on grass fell to 8° on 22nd, destroying all peach, apricot and nectarine bloom. Slight S on 20th and 22nd. Fogs from 11th to 19th. The last week milder, with light S.W. breezes. Ozone on 12 days.

WINSLOW, ADDINGTON.—A dry month with much frost, which was very severe between 19th and 26th, damaging fruit blossom even when protection was given. There was high day temp. from 11th to 16th, which made things more susceptible to the cold which followed. Twice only in 29 years has there been less R in March; viz: ·55 in. in 1892, and ·14 in. in 1893. Fog on 11th, 13th, 14th, 16th and 17th.

BURY ST. EDMUNDS, WESTLEY.—Dry and cold. Several misty mornings. Min. temp. on grass 13° on 22nd. S on 20th, 21st and 22nd.

NORWICH, BRUNDALL.—Dry and mild to the 17th, followed by an exceedingly cold week from 18th to 25th, with S daily; that on 19th yielding ·73 ins., and being 8 inches deep on the level. Milder from 25th to the close. At Norwich on 20th at 1.2 p.m. a sharp flash of L, and long rolling peal of T occurred during a storm of S and H. The min. temp. on grass fell to 9°·4 on 21st. S on 7 days. H on 9th and 18th.

WINTERBOURNE STEEPLETON.—A very dry month, and until the last week the temp. was very low. In the three months of 1899 the mean temp. has retrograded, that for January being 42°·0, February 41°·7, and March 40°·7. The week ending March 25th was much the coldest this year, the mean being 31°·7. H on 8th. S on 21st and 23rd.

TORQUAY, CARY GREEN.—R 1·79 in. below the average. Mean temp. 44°·3, or 0°·3 above the average. Duration of sunshine 192 hrs. 5 mins., being 48 hrs. 55 mins. above the average.

POLAPIT TAMAR [LAUNCESTON].—The wind in the earlier part of the month kept in the N. or E., and it was fine up to the 8th, with more or less fog in the mornings. S and H fell on 8th, followed by generally fine weather till 21st, when it became wintry, and the 22nd was the coldest morning of the year, the temp. on grass falling to 10°. The latter part of the month was dull, damp and warm. Fog on seven days. S on 20th, 22nd and 23rd.

WOOLSTASTON.—A very cold month, with constant frosts till the last week, when it became genial and spring-like. S fell lightly on 4th, 21st and 22nd. Violent storms of H on 9th. Mean temp. 42°·2.

BREADSALL PRIORY.—Very cold and dry generally. S on 19th, 20th and 21st. Fog on 15th and 16th.

WALES.

HAVERFORDWEST.—The weather up to the 20th was fine and generally sunny, with keen frosts at night; unusual heat occurring on several days, notably the 15th. On the morning of 20th S began to fall, and the Precelly range was covered for 5 days; while on 21st the whole district was covered by from 3 to 4 inches of S. No such severe weather has occurred here since the great frost of February, 1895. Heavy R fell on 25th, and it continued rainy, stormy, and mild till the end.

GOGERDDAN.—Very changeable. From 5th to 17th it was unusually hot for March, while on 21st six inches of S fell after severe frost in the night.

SCOTLAND.

CARGEN [DUMFRIES].—The meteorological feature of the month was the remarkable variation of temp. After a period of unusual mildness (the mean temp. of the 8 days, 11th to 18th almost reaching 46°) the temp. suddenly fell and bitterly cold weather accompanied by sharp N.E. wind set in continuing till 25th, for which time the low mean of 32°·7 was recorded. Notwithstanding the coldness of these 7 days the mean for the month is nearly 1° above the average. The R is largely in excess of the average, but more than half the total fell on 25th and 28th. Prevailing winds N.E. S on 4th. Duration of sunshine 11 hours above the average. The frost and wet weather were unfavourable for sowing corn, and pastures made little growth.

EDINBURGH, BLACKET PLACE.—The mean temp. of the week ending 26th, was 32°·6 or 8°·6 below the average. The only colder week so far on in the season during the last 42 years, was that ending March 29th, 1879, with a mean temp. of 32°·0. Absolute drought from 9th to 23rd inclusive. Soft H on 19th and 22nd. Solar halo on 10th.

COLMONELL.—R ·46 in. below, and mean temp. 2°·6 above, the average of 23 years. S on 19th, 21st and 24th.

TIGHNABRUAICH.—More of a winter than a spring month. The ground cold and wet.

ABERDEEN, CRANFORD.—The first part of the month was fine and mild, but the weather changed on 17th, and on 18th there were strong winds from N.N.W. with S showers and between 20th and 21st a heavy fall of S.

S. RONALDSHAY, ROEBERRY.—A rough cold month. S from 18th to 27th inclusive. Mean temp. 38°·3 or 1°·1 below the average of 9 years. Mean max. 43°·3, mean min. 33°·2.

IRELAND.

BROADFORD, HURDLESTOWN.—A curious March. Some days were hot as any in July and others were very cold. Rainfall ·89 in., and rainy days one, below the average of 14 years. H on 7th. S on 20th, 21st and 22nd.

DUBLIN, FITZWILLIAM SQUARE.—A dry and generally favourable month. From 12th to 19th conditions were anticyclonic and the diurnal range of temp. was large. Mean temp. 45°·1 or 2°·0 above the average. Fog on 4 days. High winds on 9 days, reaching the force of a gale on 28th and 29th. S or sleet on 5 days. Solar halos on 26th and 27th, and lunar halos on 19th and 24th.

OMAGH, EDENFEL.—Up to the 18th, with but little intermission, the weather was remarkably fine, the third week being especially brilliant, culminating on 16th in a max. temp. of 64°, the highest ever recorded so early in the season; but on 19th there followed the inevitable rebound to cold, harsh, unsettled and snowy days, and keen, frosty nights; the month terminating with heavy rains and close, humid atmosphere.

. CCCC.]
OL. XXXIV.

[PRICE SIXPENCE.
Or 6s. for 12 issues post free.

THE NEW YORK PUBLIC LIBRARY ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
Obituary	49
Ozone	50
Whirlwind at Worstead, Norfolk, March 29th, 1899	51
Weather at Klondike	52
Winter Minima on British Mountain Tops	53
Excessive Terrestrial Radiation	54
Botany and Meteorology	55
A Monster Meteorite	55
REVIEW:—	
Les bases de la Météorologie dynamique, Historique, État de nos connaissances	56
Royal Meteorological Society—The Society's New Home	57
Results of Meteorological Observations at Camden Square during April for 40 Years, 1858–97	59
Climatological Table for the British Empire, November, 1898	60
Supplementary Table of Rainfall, April, 1899	61
Rainfall and Temperature in April, 1899, at 50 Stations	62
Meteorological Notes on April, 1899	63

MAY, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy Meteorological Societies, and of the British Astronomical Association; Artic by various eminent Astronomers, English, American, and Continent Correspondence on topics of interest connected with the Science; Notices Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assista and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observato Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 1

NOTICES.

It is requested that all Books for Review, and Communications the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCC.] MAY, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

OBITUARY.

[THE rules which govern notices under this head, seem to be imperfectly known, and this has led to expressions of surprise, that our recent heavy losses of valued rainfall workers have not been noticed. Within a few weeks or months we have lost the Rev. Canon Du Port, Miss E. Brown, and three of the few remaining contributors to English Rainfall, 1860, viz., Hale Wortham, the Rev. Canon Slatter and Mr. Prince.

The explanation is that this Magazine is Meteorological, not merely rainfall, that a portion of *British Rainfall* has for many years been appropriated to notices of deceased observers, and that, greatly as we regret and suffer by such losses as those above mentioned, we consider that the rainfall volume is the place in which they should be recorded. This *Magazine* is so small that notices in it must be rare, and awarded only to those who, as authors, inventors, or directors of important systems, have contributed to the advance of the science of Meteorology. No one appreciates, more highly than we do, the services of the rank and file of meteorological observers, but the army is so large that we can notice fully, only the leaders.]

Charles Leeson Prince. Mariano de la Bárcena.

In Mr. Prince we have lost one who has been our fellow worker for more than 40 years, whose records cover nearly 60 years, whose publications give far and away the best information as to the climate of Sussex, and who proved his interest and ability, in matters meteorological and classical, by preparing and gratuitously distributing the best English translation and best bibliography in any language of the *Διοσημεία* of Aratus.

Signor Mariano de la Bárcena has held the distinguished appointment of Director of the Central Meteorological Observatory of Mexico, for the long period of 22 years, in fact he must, we believe, be regarded as the founder of the Mexican Meteorological Service.

OZONE.*

THE large volume, which has led to the preparation of this article, is composed of the series of reports submitted by the author to the Royal Society of Public Health of Belgium, from their commencement in 1886 to the end of 1896.

There is not that summary of the ten years work which we should have liked to see, but on the other hand, there are many very useful and sensible remarks scattered through the reports. Perhaps the best part of the literary matter (we have not attempted to analyse the 200 or 300 pages of tables) is an article of 17 pages with the title "*L'Ozone Atmosphérique et l'Ozonométrie en Belgique; résumé de six années d'observations 1886-91.*" M. Van Bastelaer seems to hold precisely the view which has repeatedly been expressed in this Magazine, that, granting all that opponents may allege as to the want of accuracy of Schönbein's original method, granting even that the papers are acted upon by other agents than ozone, it is better to improve the method as much as possible, and adopt it, rather than do as some advise, (and as 9 observatories out of 10 practice) viz., neglect the subject *in toto* because it cannot easily be done perfectly.

Even if it be true that Ozone papers do not indicate the presence of Ozone—we should still urge that a record of their discolouration should be kept—*Because* we know of no equally simple and trustworthy indication of the freshness of the atmosphere.

On this point we translate an interesting passage in M. Van Bastelaer's report.

"Perhaps I may be permitted to quote this subject of Ozone as one more proof that, frequently, new discoveries are merely the expression in scientific form of facts long known to everybody, but expressed in a different manner.

The ordinary citizen does not know the word ozone, but when ozone is abundant he says that 'the air is fresh'—Take the following remarks:—

Send the children into the country to get some fresh air.

Mountain air is always fresh.

Sea air is always good.

There is no freshness in the air of towns, houses and rooms.

Country air is a disinfectant, and whitens the linen, especially in April and May.

Fresh air bleaches clothes and ivory, and is life-giving to human beings.

Other things being equal, the conditions named above, are precisely those in which the maximum of coloration of ozone papers takes place,—and in all the above remarks it is merely necessary to

---

*Mémoires d'Ozonométrie. Observations et Rapports par D. A. Van Bastelaer. Directeur du service ozonométrique de la Société royale de médecine publique de Belgique. Bruxelles 1897, 8vo.

substitute the word 'ozone' for the words 'fresh air' to make the statements scientifically accurate."

Conclusions. Although at individual stations the amount of discolouration varies greatly from day to day, the means remain very steady from month to month and from year to year. Some places, especially Flanders and the neighbourhood of the Ardennes, have constantly much higher means than others, information as to which may be useful to medical men.

The author prints the mean for each station for each 5 days throughout the year. This he does apparently in the hope that some one will compare these figures with the number of deaths registered. But we find few instances of such workers arising, and think that, if it is to be done, it will probably fall to the lot of M. Van Bastelaer, and he could work just as well from MS., as from print. If the mass of printing given at present were reduced to a sixth, as it would be if *monthly* averages were given, (instead of the present penthemerals), the cost would be so much reduced that summaries and maps of great interest could be given, and then the records could be submitted to close scrutiny, and careless observers detected.

It seems to us that the author is allowing himself to be buried under the mass of data sent in, whereas his duty is to keep well above it, and to give the broad general features arrived at.

But, that his work should be stopped because the papers do not give absolute precision, or because the statistics of ozone and of disease and death have not yet been rigorously compared, seems to us very absurd. M. Van Bastelaer says with justice, "Compare the ozone records from my 150 observers with the statistics of disease and death, if a relation exists let me go on, if there is no relation then my work should be stopped." We decline to believe that this reasonable proposal was rejected.

WHIRLWIND AT WORSTEAD, NORFOLK, MARCH 20, 1899.

[Having heard of damage by a whirlwind in the north of Norfolk, we wrote to Mr. A. W. Preston (who has kindly continued the collection and publication of rain returns so long carried on by the late Canon Du Port), asking him for particulars. Fortunately, our observer at Worstead was an eyewitness and has favoured us with the following description, and a map which it hardly seems worth while to engrave. Worstead is 11 miles N.N.E. of Norwich and 6 miles S.S.W. of the Norfolk coast; about 52° 47′ N. and 1° 24′ E. The track was about 2 miles long, starting from a little E. of N. and ending slightly W. of S. Mr. Cross was driving from N.W., and therefore not far from at a right angle to the path, and not a quarter of a mile from it.]

About 12.20 noon I was driving from North Walsham and saw a large column of snow being raised from the ground and whirled about. Not only were the motions vertical and horizontal, but the snow was being driven in every possible direction. The wind was N. but very light, and no snow was falling at the time. The height of the column was about 30 yards and its diameter between 12 and 15 yards. Its rate of progress was not more than 30 miles per hour. In its track the snow was heaped in ridges or wreaths. Owing to the noise made by my trap I did not hear any sound, but persons living in the vicinity of its course compared the noise to distant thunder.* It was immediately followed by a very heavy fall of hail, some of the stones measuring upwards of one inch in circumference.

The first actual damage appeared to have occurred to a cottage on the White Horse Common, from the roof of which some tiles were stripped. No other buildings stood in its track until it reached Withergate, where it stripped some tiles off the roofs of two cottages and lifted the wood top from a well of water (the top would weigh roughly about 1 cwt.); it then crossed the road to Bunn's Farm, where it struck a corn stack and sent the thatch and corn flying in all directions. Beyond this place I can find no trace of it.

ROBERT CROSS.

Worstead.

WEATHER AT KLONDIKE.

"In the 'Klondike Number' of the *National Geographic Magazine*, (April), General Greely has collected, in a brief article, what little is known about the climatic conditions of the Klondike district. The observations of most interest are those made at Dawson between August, 1895, and November, 1896. From December 1st, 1895, to February 1st, 1896, the temperature fell below zero every day. It was below —40° on 28 days; below —50° on 14 days, and below —60° on 9 days. In 1896, the January mean was —40°·7, and the February mean —35°·4. Bright weather is the rule in winter, and from October 1st, 1895, to May 1st, 1896, snow fell on only one day in seven. During June, July and August, 1896, the temperature rose above 70° on 29 days and above 80° on 3 days. July was the only month in which the minimum did not sink below freezing point. In June it rained on 12 days. Observations at Fort Reliance, near Dawson, gave the following means: December, 1880, —31°; January, 1881, —7°; February, 1881, —29°. The thermometer registered between —40° and —66° on 35 days. Snow fell on but one day in February, and 25 days were perfectly clear."—*Science, New York.*

* Very probably it was T, partly because H is said to have followed, and partly because Mr. Preston reports that at Norwich there was a snow and hail storm and, at 1.2 p.m. one vivid flash of L, followed almost immediately by a long rolling peal of T, and also that at 1.30 p.m. a peal of T was recorded at Brandall, about 10 miles S. of Worstead.

WINTER MINIMA ON BRITISH MOUNTAIN TOPS.

To the Editor of the Meteorological Magazine.

SIR,—In reading of the extraordinary minimum temperatures recorded by Dr. Miller on Sca Fell, it occurred to me that the results were due to his minimum thermometer not being rigidly fixed, and so being liable to be shaken by wind. I have found that if an ordinary standard minimum thermometer be simply hung up horizontally on projecting screwheads, in a thermometer screen (Royal Meteorological Society's pattern), without being fixed perfectly fast, it is invariably shaken during severe gales, and the index moved downwards towards the bulb, thus giving an incorrect minimum. I have known an error of 10° or more due to this, my screen being unavoidably placed in a very windy spot, the only one available. I now always wedge fast my thermometers. If this can occur in a standard screen in my garden at Ilkley, why should not Dr. Miller's thermometer, "suspended in a deal box having the sides and base riddled with small holes," have been similarly affected on the summit of Sca Fell Pike, perhaps the windiest spot in England? I think that the above may explain how such remarkable results were obtained.

We know that although there is usually a fairly uniform reduction of temperature for increase in altitude, the reverse is often the case during calm, clear nights (especially during anti-cyclonic conditions in winter), at any rate up to a moderate elevation, say to 3,200 or 4,400 ft., the limit in height of English and Scotch mountains. In fact we find that the absolute yearly minima observed in our lowlands are often actually *lower* than those on our mountains. The minima on mountains frequently occur during more or less windy, unsettled weather, when the temperature is relatively high below. Our British mountains would probably have to be about 1,000 ft. higher (say a total of 4,000 to 5,000 ft.) before an elevation was reached at which the absolute yearly minima would be always lower than in the plains.

Yours truly,

ALBERT WILSON.

Eaton Road, Ilkley, April 25th.

[Although Dr. Miller reported that the thermometers were "*fastened* in the case," we insert this letter for two reasons, (1) because it is by no means improbable that the case itself vibrated considerably, and may thus have caused the error, and, (2) because it is not on Sca Fell only that observers need be watchful that vibration does not cause sensational minima.—ED.].

EXCESSIVE TERRESTRIAL RADIATION.

To the Editor of the Meteorological Magazine.

SIR,—I enclose register of the excessive terrestrial radiation during the last nine days, due to the *very* dry air and clear cloudless skies at night. I have three exposed thermometers, two close together and the third 4½ feet away. The former read practically the same, the mean difference being only 0°·05, and the greatest 0°·4, and it is the readings of one of these two that I give. The third reads somewhat higher—the mean difference 0°·6, and greatest 1°·6. They are all delicate thermometers, with bifurcated bulbs, and are examined after every observation to see that no spirit is condensed at the top, and they are often tested either with a standard in water or in melting snow when there is any.

I give also all the previous readings as low as, or lower than, 4°·6 since I began in April, 1882, and the only previous occasion on which, for five consecutive days, the readings were below 10°, namely in February, 1895, when, however, the screen readings were much lower than on this occasion.

	Screen.	Grass.	Difference.
	°	°	°
Mar. 19, 1899	26·9	13·3	13·6
,, 20, ,, ...	28·9	13·1	15·8
,, 21, ,, ...	22·3	5·8	16·5
,, 22, ,, ...	23·1	7·3	15·8
,, 23, ,, ...	23·1	5·6	17·5
,, 24, ,, ...	23·0	4·6	18·4
,, 25, ,, ...	27·2	8·6	18·6
,, 26, ,, ...	41·5	24·3	17·2
,, 27, ,, ...	40·0	21·4	18·6
Means ..	28·4	11·5	16·9
Dec. 15, 1890	18·0	4·5	13·5
Jan. 19, 1891	14·3	2·3	12·0
,, 10, 1892	20·2	4·0	16·2
,, 11, 1895	14·9	2·6	12·3
Feb. 5, ,, ...	18·6	8·1	10·5
,, 6, ,, ...	12·6	3·3	9·3
,, 7, ,, ...	14·4	7·6	6·8
,, 8, ,, ...	15·3	8·1	7·2
,, 9, ,, ...	13·8	0·6	13·2

The lowest reading in any previous March :—

Mar. 7, 1886	21·9	6·5	15·4

Yours very truly,

R H. BARNES.

Heatherlands House, Parkstone, Dorset, 27th March, 1899.

P.S.—Now that March is complete, I send you the means of minima in screen and on grass for March, 1899, showing the remarkable difference of 14°·7 :—

Mean minima in screen	34°·1
,, ,, on grass.....	19°·4
	14°·7

The greatest difference I have previously recorded has been 11°·5, on two occasions :—

	March, 1893.	April, 1898.
Mean minima in screen	37°·5	38°·6
,, ,, on grass	26°·0	27°·1
	11°·5	11°·5

R. H. B.

April 1st.

BOTANY AND METEOROLOGY.

[The following two notes have been submitted recently to the Scientific Committee of the Royal Horticultural Society, and will probably be of interest.]

FLOW OF SAP IN A SYCAMORE DURING FROST.—Mr. T. R. Bruce, The Old Garroch, New Galloway, sent the following communication :—"I noticed icicles hanging on a newly-cut branch during the whole of last week, and steadily increasing, although the mean temperature of the week was only 30°. The mean temperature of the 24th of March was only 25°·7. The cut branch would be about half an inch in diameter, and some pounds weight of icicles, or pints of sap, have flowed out during the week, and it still continues to flow. The maximum and minimum temperatures were as follows :—

19th.....	42°·5	21°·0	23rd.....	37°·5	21°·5
20th.....	42·5	23·0	24th.....	40·0	11·5
21st.....	38·5	15·0	25th.....	43·0	23·0
22nd	38·0	21·5			

EFFECT OF LIGHTNING ON AN OAK.—A specimen received from Dr. Plowright, of Lynn, showed how oak wood is sometimes torn into longitudinal fibres by electricity. "The trunk from which this specimen was taken was that of a tree grown in East Anglia, and purchased for timber by a timber merchant in King's Lynn, from whose wood yard it was obtained. The amount of injury was comparatively slight, consisting only of a groove cut from top to bottom of the trunk, about 2 inches wide, and extending only a very short distance into the woody tissues, but tearing them up longitudinally into strips several feet in length."

A MONSTER METEORITE.

A VALUABLE addition to the treasures of the Meteorological Section of the British Museum, is on the way from Australia. This is what is known as the "Bruce" meteorite—a monster stranger from the skies, weighing close upon four tons. It has had an interesting career. Where it came from of course no man knoweth, but it fell at Murrangeng, in South Australia. Mr. Bruce, who now lives in Scotland, bought it for £2 of a farmer (who had no use for

meteorites), for the purpose of presenting it to the British Museum. The Government of Victoria interested itself in trying to retain the curiosity, and offered Mr. Bruce £1,000 for his rights, but the Scotsman replied that "money would not buy it"; so the article is now on the way over. It is composed of almost pure iron, and is said to be the most rare specimen of its sort in the world, though as to weight and composition it does not beat the forty-ton meteorite, said to have been discovered by Sir John Ross in Greenland, in 1818. Another celebrated meteorite, the "Cranbourne," found in 1865 in Australia, which has been in England, has been re-purchased by the Colony, and returned.—*Grantham Journal*, January 7th, 1899.

[We never previously heard of the "Meteorological Section of the British Museum," but we are aware of the excellent specimens of meteorites in the Natural History Museum at S. Kensington, and are very glad that so large a one is to be added to the collection. ED.]

REVIEW.

Les bases de la Météorologie dynamique, Historique, État de nos connaissances par M. le Prof. Dr. H. H. HILDEBRANDSSON, Directeur de l'observatoire Météorologique d'Upsal, et M. LEON TEISSERENC DE BORT, Directeur de l'Observatoire de Météorologie dynamique, Trappes, Paris. 1re livraison. Gauthier Villars, Paris, 1898. Large 8vo, 60 pp., maps and engravings.

WE should have noticed this interesting paper earlier, but as our copy was marked "Probeshefte" we were not sure that it would be agreeable to the authors. As we see that a copy has been presented to the *Soc. Mét. de France* we regard the restraint as removed, and have pleasure in calling the attention of our readers to the paper.

We cannot give a better idea of the work than by quoting the head lines of the chapters of the Part now before us, and of those to follow.

PART I.

Early workers—Halley, Hadley, Dove, Maury.
Early researches on Tropical storms—the circular theory.
Early studies of the storms of the temperate latitudes—Centripetal theories of Brandes, Espy, and Loomis.

PART II.

Cyclonic storms in Europe—Organization of the International Meteorological service—Le Verrier, FitzRoy, and Buys Ballot.
Standard works in the various countries (1865–72). Buchan, Jelinek, Mohn, Hildebrandsson, Clement Ley, &c.
On the distribution of vapour in the atmosphere. Le Roy, Dalton, &c.

PART III.

Normal distribution of meteorological elements on the surface of the globe—Maps indicating the distribution of temperature, pressure, wind, rain, and cloud.
Distribution of meteorological elements around areas of maximum and of minimum pressure.

If the subsequent parts equal the first (and we do not doubt that they will) the volume will be a very pleasant, useful and interesting one.

There is one point only on which we think that the authors have been misled—they attribute the use of the word "Horn" by Piddington—*The Sailor's Horn-Book of the law of Storms*—to the two engraved transparent slices of horn which are in pockets in the covers of the book to enable readers to trace the positions of the centres of storms. The real origin of the term is interesting as a link with very early times—the very infancy of printing and (we might almost say, in this country) of learning. Horn-Books were, we believe, rather slabs than books, pieces of board on which the alphabet, and a few simple words printed upon paper, were placed, and then covered with thin horn to prevent their being dirtied or torn. The word "Horn-Book" is therefore synonymous with "Primer," something very easily understood, and, as the preface shows that that was Piddington's aim, his use of the word is fully explained.

ROYAL METEOROLOGICAL SOCIETY.

The Society's New Home.

Nobody probably, can explain why the English Government helps the great Scientific Societies, and does not help the little ones. The Royal, The Society of Antiquaries, The Royal Astronomical, The Linnæan, The Geological and The Chemical (several of them, be it noted, not "Royal" Societies), are provided with sumptuous quarters (in several cases with residences for the officials), free of rent and taxes. The Royal Meteorological, and others that we could name, are left to pay rent, rates, &c., in an expensive part of the metropolis, where alone their offices would be generally accessible.

The Royal Meteorological Society is no *protégé* of the Government; all that it has, and all that it does, it owes to its Fellows, past and present, and though it has not the help extended to the other Societies which we have named, it has something which the Fellows, being mostly Britons, esteem highly—absolute independence. Moreover the Society may well be proud of the work which it has done, and of the rooms now available for the use of the Fellows.

Until 1872 the Society had no rooms, and a few books in boxes at the President's and Secretary's houses represented the library. Then it took *one* room (if we are not mistaken) on a top floor in Great George Street, the books were collected, and a few shelves were prepared to hold them. After a few years a second room was obtained, then came an increase in the staff. Still more space for the rapidly growing library, and for additional assistants, was necessary, and the Society took the second floor of 22, Great George Street. The Council secured a lease of these premises, fitted them

up, plainly but comfortably, and hoped to continue there for many years. The site being exceptionally advantageous, because it was very handy (i.) to the many Fellows who are Engineers and whose offices were closely adjacent; (ii.) to the Institution of Civil Engineers, the Council of which has for nearly a quarter of a century gratuitously allowed the Royal Meteorological Society the use of their Meeting Room.

All this has been swept away by the Government Act which appropriated the site, and which was followed by the formal notice of ejectment. Of course, the Society claimed compensation, but it is an expensive luxury to fight a Government department, and the Society had to abate its claim, and to seek new quarters. These were exceptionally hard to find, for the wholesale clearance of surrounding property compelled hundreds (who all wanted to be near their old places) to compete for everything available. So the Society has had to move nearly to the Victoria Station end of Victoria Street, more than half-a-mile W.S.W. from its old rooms.

However, there was no help for it; and, as the Fellows will see on May 16th, the new rooms are more lofty and more spacious than the old. The contrast between the bare top room, single-handed worker and few shelves of 1872, and the handsome suite of rooms, four assistants and thousands of volumes of 1899, shows what Englishmen will do, whether their Govermnent help them or not.

The monthly meeting of the Society was held on Wednesday evening, April 19th, at the Institution of Civil Engineers, Westminster, Mr. F. C. Bayard, LL.M., President, in the chair.

Mr. W. H. Butlin, B.A., was duly elected a Fellow of the Society.

Earth Temperature.

Mr. H. Mellish, F.R.Met.Soc., read a paper on "Soil Temperature," in which he discussed the observations which have been made at the stations of the Royal Meteorological Society, with thermometers, at various depths in the soil. These records have been carried on at many of the stations since 1881, and at one or more of the following depths: 3 inches, 6 inches, 1 foot, 2 feet, and 4 feet. It appears that at nearly all stations the annual temperature, at a depth of 1 foot, is slightly higher than that of the air. In winter the air and the soil at 1 foot have about the same temperature, the soil being often a little warmer till about the end of January, after which, for the next two months, the air has a small advantage; but in the summer months the soil at one foot is generally warmer than the air, the difference at several stations exceeding 3°. Mr. Mellish shows that on the mean for the year, light soils are 1°·0 warmer than the air, while the strong ones are only 0°·2 warmer; and he is of opinion that near the surface we may expect to find wider extremes of temperature in light soils than in strong ones; but that as the heavier soils are better conductors of heat than light ones, extremes of temperature are propagated to greater depths in heavy soils than in light ones.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

APRIL.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	2·90	10	·75	0	46·4	43·6	79·9	58·9	27·1	39·3	..	..	..	..	5·8
1859..	2·61	16	·44	0	47·0	43·8	78·5	56·4	24·5	38·1	..	..	..	..	5·9
1860..	1·45	13	·39	0	43·2	40·4	66·2	53·8	27·9	35·3	..	..	21·4	31·8	5·6
1861..	1·30	6	·46	0	44·9	41·9	64·8	56·2	27·8	35·9	..	..	19·6	30·9	5·6
1862..	2·30	15	·67	0	49·4	46·3	73·5	57·7	27·1	41·8	..	..	19·4	37·7	6·1
1863..	·52	7	·14	0	49·6	46·1	70·2	60·9	28·8	40·6	..	..	23·0	36·3	4·6
1864..	·82	4	·47	0	48·6	45·1	75·9	60·3	33·2	40·1	..	..	27·3	36·8	5·5
1865..	·33	5	·11	0	51·6	48·1	81·4	67·7	32·6	42·4	..	..	26·8	37·7	3·6
1866..	1·76	13	·74	0	48·5	45·3	79·4	58·5	33·8	41·4	..	..	26·8	36·1	5·4
1867..	2·36	21	·43	0	50·2	47·1	66·4	59·0	30·8	43·2	..	..	25·4	39·4	7·0
1868..	1·50	12	·66	0	48·8	45·7	68·8	59·3	30·5	41·1	..	..	24·0	37·0	7·0
1869..	1·28	8	·41	0	51·3	47·7	78·5	62·9	28·6	42·1	..	..	24·5	38·7	6·7
1870..	·47	6	·12	0	49·1	44·6	79·4	62·8	26·7	38·3	121·4	106·0	22·3	33·8	4·3
1871..	2·84	18	·71	0	48·2	45·7	66·0	58·1	28·3	41·6	122·0	96·5	24·9	38·9	6·2
1872..	1·39	16	·31	0	49·2	46·0	70·2	60·1	29·4	40·4	113·4	101·0	26·2	36·8	5·2
1873..	·55	11	·11	0	46·3	43·1	75·5	57·7	29·9	38·8	115·8	96·2	26·6	34·6	5·6
1874..	1·26	11	·33	0	50·4	47·0	79·2	61·9	32·7	42·1	121·6	100·5	28·9	38·8	5·2
1875..	1·53	10	·66	0	46·8	43·3	74·0	58·3	29·3	38·0	118·8	94·5	25·9	35·8	5·5
1876..	1·90	11	·37	0	47·7	44·9	71·1	57·5	30·7	41·5	117·2	96·2	25·4	36·3	6·2
1877..	2·59	16	·66	0	46·1	43·8	64·0	54·9	33·4	40·7	111·0	88·6	30·2	38·4	7·1
1878..	4·97	16	2·56	1	48·0	45·8	69·4	58·7	27·2	40·9	117·0	97·0	20·8	35·9	5·7
1879..	2·72	16	·53	0	43·6	41·3	61·7	53·1	26·8	37·2	117·6	92·5	24·7	34·3	6·9
1880..	2·15	17	·73	0	47·4	44·2	67·4	57·0	34·3	40·9	120·2	100·4	28·6	36·7	6·6
1881..	·46	9	·21	0	45·7	42·2	67·8	56·9	27·8	38·2	120·5	103·0	23·8	33·6	6·4
1882..	2·83	14	1·08	1	48·0	44·7	65·5	58·2	32·6	40·8	116·6	99·6	27·4	35·9	6·4
1883..	1·56	9	·60	0	47·0	43·3	68·9	58·7	29·3	38·9	111·6	94·2	24·7	35·7	5·7
1884..	1·02	14	·36	0	45·6	42·4	68·4	54·9	29·9	37·8	107·0	87·6	26·5	34·2	6·3
1885..	2·32	11	·79	0	47·5	43·9	72·8	58·4	29·3	39·7	112·8	92·6	22·3	33·8	5·6
1886..	1·22	15	·30	0	46·2	43·1	69·6	56·9	32·2	40·1	108·7	92·3	25·8	35·6	5·5
1887..	1·41	10	·30	0	43·2	40·5	68·2	55·1	26·2	36·4	113·4	94·2	21·8	31·6	5·3
1888..	2·37	13	·66	0	43·3	40·8	64·8	52·4	27·7	37·1	111·1	90·0	20·1	32·4	6·9
1889..	2·06	20	·35	0	45·4	43·1	63·9	54·4	32·4	39·5	104·4	88·7	25·1	35·8	6·7
1890..	2·02	16	·54	0	45·7	42·5	64·3	54·9	30·5	38·7	110·9	92·3	23·2	33·9	5·9
1891..	1·13	9	·46	0	44·5	41·2	66·3	53·7	28·1	36·6	111·3	87·9	21·9	30·4	6·1
1892..	·99	9	·27	0	46·3	42·0	73·0	59·6	28·2	36·8	118·7	100·4	21·7	30·2	3·2
1893..	·24	3	·20	0	49·8	45·2	78·2	65·6	30·9	40·4	117·8	101·9	25·2	37·0	3·1
1894..	1·74	14	·58	0	50·4	47·1	73·3	61·2	34·5	42·5	116·6	96·0	27·1	36·5	5·7
1895..	1·34	13	·61	0	47·7	44·9	67·1	57·9	29·1	40·8	113·6	93·8	25·4	37·0	6·3
1896..	·55	11	·08	0	49·2	45·4	68·4	58·6	32·8	41·5	114·7	96·5	24·0	34·0	5·2
1897..	1·57	16	·23	0	46·0	43·2	67·3	55·3	27·8	39·6	108·9	92·2	20·7	34·5	6·7
Mean ...	1·66	12	·51	0·1	47·3	44·2	70·7	58·1	29·8	39·7	114·8	95·5	24·5	35·4	5·8
Extremes	4·97	21	2·56	1	51·6	48·1	81·4	67·7	34·5	43·2	122·0	106·0	30·2	39·4	7·1
	·24	3	·08	0	43·2	40·4	61·7	52·4	24·5	35·3	104·4	87·6	19·4	30·2	3·1

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	60·6	3	27·3	23	51·0	41·2	42·8	89	89·8	21·9	1·94	13	7·1
Malta	76·2	2	54·5	25	71·5	60·6	58·5	82	137·7	51·0	2·53	11	3·5
Cape of Good Hope	86·9	28	46·5	2	72·6	57·3	54·9	70	...	...	1·06	5	4·5
Mauritius	85·4	30	63·0	7	81·9	67·7	64·5	74	135·6	55·0	·90	9	5·2
Calcutta	85·7	9	57·7	16	82·0	63·6	62·0	70	144·8	49·2	·00	0	1·8
Bombay	92·4	8	70·5	25	88·9	75·4	70·2	68	139·2	61·1	·13	2	1·8
Ceylon, Colombo	90·4	26	72·0	20*b*	86·2	73·7	72·6	84	162·0	69·0	17·38	20	6·2
Melbourne	91·5	1	44·3	6	72·4	52·1	44·6	57	148·2	35·1	·67	9	6·6
Adelaide	98·2	11	45·6	25	74·4	54·0	47·4	56	155·7	38·6	1·34	12	5·4
Sydney	93·7	2	53·6	11	77·3	61·5	53·8	58	146·0	44·1	·46	4	4·5
Wellington	71·5	30	44·0	13	63·3	50·9	46·5	67	130·0	37·0	2·69	17	4·5
Auckland	78·0	26	48·0	1	67·5	54·9	52·9	74	132·0	42·0	2·39	12	5·3
Jamaica, Kingston	89·9	8	62·6	12	87·7	71·1	69·0	75	...	...	1·03	5	...
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...
Grenada	86·2	9*a*	69·4	1	83·4	74·1	71·5	74	152·4	...	7·57	18	2·0
Toronto	58·0	4	8·0	27	43·9	28·5	32·1	82	72·5	5·0	3·02	15	6·7
New Brunswick, Fredericton	59·7	6	13·2	26	42·5	28·4	30·3	74	...	...	5·38	15	7·7
Manitoba, Winnipeg	50·7	3	−17·9	26	28·1	10·6	...	...	...	...	2·00	9	6·4
British Columbia, Esquimalt	53·4	15	31·3	20	47·6	39·4	..	...	...	...	4·44	24	7·6

a—and 13. *b*—and 21, 27.

REMARKS.

MALTA.—Adopted mean temp. 64°·9, or 2°·9 above the average. Mean hourly velocity of wind 8·4 miles. Mean temp. of sea 71°·1. T8S on 21st and 22nd. L on 10 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3 below, of dew point 0°·3 above, and rainfall ·91 in. below, their respective averages. Mean hourly velocity of wind 8·9 miles or 1·9 below average; extremes, 20·2 on 2nd and 2·0 on 21st; prevailing direction S.E. by E. to E.N.E. L on 15th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 79°·0, or 0°·8 below, of dew point 0°·3 above, and rainfall 4·75 in. above, their respective averages. Mean hourly velocity of wind 7·6 miles; prevailing direction S.W., N.W., and N. T8S on 9 days. L on 16th. H. O. BARNARD.

Adelaide.—A cold and windy month, the mean temp. and pressure being respectively 2°·9, and ·104 in. below the average of previous years. Rain ·35 in. above the average. C. TODD, F.R.S.

Sydney.—Temp. 2°·8 above, humidity 11° and R 2·68 in. below, the average. The hot weather of September and October was not repeated, but the generally dry weather continued. H. C. RUSSELL, F.R.S.

Wellington.—Generally showery up to the 24th, with only a few fine days, the end of the month fine. Prevailing winds N.W., and frequently strong. T on 18th. Mean temp. 0°·6 above, and rainfall 1·48 in. below, the average. R. B. GORE.

Auckland.—Unusually fine. Rainfall ·75 in. below the average of 31 years. Mean temp. 1° above, the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Rainfall, 1·53 in. below the average at Kingston, and below the average in every division of the Island. R. JOHNSTONE.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	2·29	XI.	Builth, Abergwesyn Vic.	7·48
II.	Dorking, Abinger Hall .	2·94	,,	Rhayader, Nantgwillt ...	6·60
,,	Birchington, Thor	2·65	,,	Lake Vyrnwy	5·22
,,	Hailsham	2·85	,,	Corwen, Rhug	...
,,	Ryde, Thornbrough	2·95	,,	Criccieth, Talarvor	3·92
,,	Emsworth, Redlands ...	2·76	,,	I. of Man, Douglas	4·57
,,	Alton, Asbdell	3·10	XII.	Stoneykirk, Ardwell Ho.	3·22
III.	Oxford, Magdalen Col..	1·83	,,	New Galloway, Glenlee	4·90
,,	Banbury, Bloxham	2·26	,,	Moniaive, Maxwelton Ho.	3·87
,,	Northampton, Sedgebrook	1·93	,,	Lilliesleaf, Riddell	2·69
,,	Stamford, Duddington..	1·72	XIII.	N. Esk Res. [Penicuick]	4·65
,,	Alconbury	1·81	XIV.	Glasgow, Queen's Park..	4·11
,,	Wisbech, Bank House...	1·64	XV.	Inverary, Newtown	5·51
IV.	Southend	2·61	,,	Ballachulish, Ardsheal...	5·79
,,	Harlow, Sheering..... ...	2·81	,,	Islay, Gruinart School ...	1·52
,,	Colchester, Lexden	1·82	XVI.	Dollar.....	3·33
,,	Rendlesham Hall	1·88	,,	Balquhidder, Stronvar...	6·80
,,	Scole Rectory	2·42	,,	Coupar Angus Station...	2·82
,,	Swaffham	2·41	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	2·77	XVII.	Keith H.R.S.....	3·59
,,	Bishop's Cannings	3·15	,,	Forres H.R.S.	3·43
,,	Blandford, Whatcombe .	3·25	XVIII.	Fearn, Lower Pitkerrie..	2·40
,,	Ashburton, Holne Vic...	4·64	,,	S. Uist, Askernish	5·70
,,	Okehampton, Oaklands.	4·17	,,	Invergarry.....	1·99
,,	Hartland Abbey	3·44	,,	Aviemore H.R.S.	2·06
,,	Lynton, Glenthorne ...	4·55	,,	Loch Ness, Drumnadrochit	3·38
,,	Probus, Lamellyn	2·87	XIX.	Invershin	4·74
,,	Wellington, The Avenue	3·29	,,	Durness	...
,,	North Cadbury Rectory	2·86	,,	Watten H.R.S.....	1·82
VI.	Clifton, Pembroke Road	3·46	XX.	Dunmanway, Coolkelure	7·27
,,	Ross, The Graig	2·13	,,	Cork, Wellesley Terrace	3·01
,,	Wem, Clive Vicarage ...	2·24	,,	Killarney, Woodlawn ..	4·08
,,	Wolverhampton, Tettenhall	2·49	,,	Caher, Duneske	2·98
,,	Cheadle, The Heath Ho.	3·11	,,	Ballingarry, Hazelfort...	3·05
,,	Coventry, Priory Row ..	2·15	,,	Limerick, Kilcornan ...	3·28
VII.	Grantham, Stainby	2·12	,,	Miltown Malbay	3·60
,,	Horncastle, Bucknall ...	1·98	,,	Gorey, Courtown House	2·26
,,	Worksop, Hodsck Priory	2·08	XXI.	Moynalty, Westland ...	3·11
VIII.	Neston, Hinderton	2·51	,,	Athlone, Twyford	3·77
,,	Southport, Hesketh Park	3·03	,,	Mullingar, Belvedere ...	3·10
,,	Chatburn, Middlewood.	3·67	,,	Woodlawn	3·85
,,	Duddon Val., Seathwaite Vic.	8·36	XXII.	Crossmolina, Enniscoe ..	5·50
IX.	Melmerby, Baldersby ...	2·46	,,	Collooney, Markree Obs.	4·54
,,	Scarborough, Observat'y	1·56	,,	Ballinamore, Lawderdale	4·08
,,	Middleton, Mickleton ...	3·09	,,	Warrenpoint.....	4·47
X.	Haltwhistle, Unthank...	2·77	XXIII.	Seaforde.....	4·37
,,	Bamburgh	2·10	,,	Belfast, Springfield	4·79
,,	Keswick, The Bank.....	4·70	,,	Bushmills, Dundarave..	4·52
XI.	Llanfrechfa Grange	4·23	,,	Stewartstown	3·89
,,	Llandovery	5·81	,,	Killybegs	7·75
,,	Castle Malgwyn	3·19	,,	Horn Head	4·59
,,	Brecknock, The Barracks	3·32	,,		

APRIL, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATU Max. Deg.	Date	Mi Deg.
			inches.	inches.	in.					
I.	ENGLAND.	London (Camden Square) ...	2·64	+ ·90	·35	9	20	65·6	1	32·1
II.		Tenterden	2·91	+ 1·19	·66	13	22	62·5	1	31·0
,,		Hartley Wintney	2·49	...	·46	20	20	66·0	2	28·0
III.		Hitchin	2·30	+ ·51	·50	16	20	63·0	1	29·0
,,		Winslow (Addington)	2·12	+ ·20	·32	6	19	64·0	1	27·0
IV.		Bury St. Edmunds (Westley)	2·18	+ ·52	·32	9	16	61·0	2	31·0
,,		Norwich (Brundall)	2·88	...	·52	7	19	62·2	2	32·0
V.		Winterbourne Steepleton ...	3·93	...	·94	13	20	58·0	10	27·0
,,		Torquay (Cary Green)	2·78	...	·46	12*a*	17	61·0	29	35·2
,,		Polapit Tamar [Launceston]..	4·08	+ 1·86	·89	20	22	59·6	30	26·0
VI.		Stroud (Upfield)	1·85	— ·30	·34	6	20	63·0	1*c*	35·0
,,		ChurchStretton(Woolstaston)	2·96	+ ·62	·39	6	19	66·0	27	29·5
,,		Worcester (Diglis Lock)	1·84	+ ·13	·35	24	18	...	..	...
VII.		Boston	1·90	+ ·19	·45	9	18	60·0	1	26·0
,,		Hesley Hall [Tickhill].....	1·75	+ ·04	·40	9	16	63·0	28	28·0
,,		Breadsall Priory	2·65	...	·47	29	20	64·0	1, 2	26·0
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ..	1·79	— ·06	·25	6*b*	13	...	...	...
,,		Skipton (Arncliffe)	6·35	+ 2·92	·83	6	25	...	...	...
,,		Hull (Pearson Park).	2·06	+ ·14	·33	6	19	63·0	28	25·0
X.		Newcastle (Town Moor)	2·87	+ 1·04	·50	14	19	...	..	...
,,		Borrowdale (Seathwaite).....	13·28	+ 6·14	1·73	5	27	...	...	...
XI.	WALES.	Cardiff (Ely).....	5·09	+ 2·68	·82	13	22	...	...	...
,,		Haverfordwest	3·77	+ 1·14	·77	20	23	56·8	29	27·3
,,		Aberystwith (Gogerddan) ...	4·03	+ 1·47	·65	9	20	62·0	28	20·0
,,		Llandudno.....	2·76	+ ·95	·62	9	21	58·0	28	32·0
XII.		Cargen [Dumfries]	4·10	+ 1·87	·82	6	15	59·0	26	25·0
XIII.		Edinburgh (Blacket Place)...	2·29	...	·32	9	19	61·2	27	28·5
XIV.		Colmonell	4·29	...	·77	12	21	60·0	26	27·0
XV.		Tighnabruaich	6·25	...	·73	6	18	58·0	25	29·0
,,		Mull (Quinish).....	5·12	+ 2·14	·96	18	22	...	...	...
XVI.		Loch Leven Sluices	3·20	+ ·98	·50	19	13	...	...	...
,,		Dundee (Eastern Necropolis)	3·00	+ ·95	·85	6	19	61·2	26	27·7
XVII.		Braemar	4·07	+ 1·65	·76	13	25	58·0	28	17·0
,,		Aberdeen (Cranford)	3·81	...	·84	6	21	62·0	1	24·0
,,		Cawdor (Budgate)	4·36	+ 2·84	·83	28	21	...	...	...
XVIII		Strathconan [Beauly]	5·78	+ 2·97	1·02	6	13	...	...	...
,,		Glencarron Lodge.....	7·91	...	1·17	28	26	59·4	26	22·0
XIX.		Dunrobin	4·04	+ 2·31	·67	5	18	55·0	3	28·5
,,		S. Ronaldshay (Roeberry) ...	2·45	+ ·84	·57	12	19	56·0	26	29·0
XX.		Darrynane Abbey.....	5·39	...	1·47	20	25	...	...	...
,,		Waterford (Brook Lodge) ...	3·13	+ ·66	·67	12	18	61·0	4	29·0
,,		Broadford (Hurdlestown) ...	2·98	...	·52	24	21	...	...	...
XXI.	IRELAND.	Carlow (Browne's Hill)	2·55	+ ·27	·36	12	21	...	..	...
,,		Dublin (FitzWilliam Square)	2·00	— ·12	·38	24	20	64·0	28	35·1
XXII.		Ballinasloe	3·47	+ 1·13	·50	6	25	60·0	24	32·0
,,		Clifden (Kylemore)	6·62	...	·93	12	26	...	...	...
XXIII		Waringstown	3·77	+ 1·35	·70	12	20	65·0	29	26·0
,,		Londonderry (Creggan Res.).	4·83	+ 2·59	·66	28	27	...	...	...
,,		Omagh (Edenfel)	4·75	+ 2·52	·60	24	23	63·0	28	27·0

+ Shows that the fall was above the average ; — that it was below it.

a—and 20. *b*—and 13, 29. *c*—and 3, 27. *d*—and 19. *e*—and 17. *f*—and 18
g—and 17, 20, 21. *h*—and 17, 18.

METEOROLOGICAL NOTES ON APRIL, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder: L for Lightning; TS for Thunderstorm: R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The wettest April for 20 years, though 1882 and 1890 had within ·20 in. of the same total. The water in the well rose from 4 ft. 8 in. to 5 ft. 10 in. Much wind from 4th to 11th, especially from N.W. on 7th and 8th. Duration of sunshine 145 hours 25 minutes; 3 sunless days.

HARTLEY WINTNEY.—The first week was warm, with light S.W. breezes, afterwards to the end the weather was very cold and wet, with rough N. or N.W. winds. Mean min. temp. 39°·3. Rainfall 1·31 in. above the average. Many sunless days. Ozone on 9 days. Nightingale heard on the 4th, cuckoo on the 14th, swallow on the wing on 19th.

WINSLOW, ADDINGTON.—The greatest April rainfall since 1889, and the greatest number of rainy days. Not much frost. Frequent high winds. H and S on 8th. Cuckoo heard on 17th; swallows seen on 18th.

BURY ST. EDMUNDS, WESTLEY.—Cold, wet and unsettled, with low temp. Foreign birds came mostly on the 20th, about one week late. Vegetation backward. TS on 29th.

NORWICH, BRUNDALL.—A cloudy month, with more rain than usual, the total being 1·21 in. above the average, and the heaviest recorded for April since 1882. Much cloud prevailed, and although the mean temp. was well up to the average, vegetation was backward, through want of sunshine. Showers of H on 8th, 11th and 16th. T 1 p.m. on 8th. Strong N. wind all day on 30th.

WINTERBOURNE STEEPLETON.—A wet month, rain falling on two-thirds of the days. The temp. also was low; the mean being 45°·6. The third week (ending on 22nd) was specially cold, the mean temp. being 40°·3, and the mean min. in shade and on grass respectively, 32°·1 and 25°·2. The temp. this year has much resembled that of last year, the mean for the first four months being—

	Jan.	Feb.	Mar.	Apr.
1898—	44°·1	41°·0	39°·5	45°·0
1899—	42°·0	41°·7	40°·7	45°·6

The rainfall to the end of April is, however, nearly double that of 1898, viz.: 14·59 in., against 7·40 in. Vegetation is backward, more warmth being wanted. Fogs on 4th, 6th, 9th, and 29th. Strong winds on 7th, 11th, and 29th. Stormy on 12th.

TORQUAY, CARY GREEN.—R ·41 in. above the average. Mean temp. 48°·8, or 0°·6 above the average. Duration of sunshine 143 hours 45 minutes, being 36 hours 10 minutes below the average; 4 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Dull, sunless, and cold, with strong winds up to the 12th, then calmer to the 19th, and rough and cold again to the end. Very wet from beginning to end.

WOOLSTASTON.—A cold, backward month, S on the 11th; T, with violent H, on 13th. Mean temp. 46°·5. Gale on 7th. Flight of wild geese passed over on 17th. Swallows seen on 19th.

BREADSALL PRIORY.—A very wet, cold, and sunless month.

BORROWDALE, SEATHWAITE.—On five days the rainfall exceeded 1·00 in., and on three days 1·50 in. S on 8th.

WALES.

HAVERFORDWEST.—The month was characterised by constant damp, and more or less wind up to the 15th, when the air became much colder, with

frost up to the 18th. From that date to the 23rd moderate gales prevailed, with heavy rain on two days. The last week of the month was much finer, with light breezes, a considerable amount of sunshine and higher temp. Blackthorn in bloom on 9th, and chestnut on the 25th; vegetation forward.

GOGERDDAN.—A very showery month, but some sharp frost about the middle did much damage to fruit trees and early potatoes.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, rainy, sunless month. The readings of the bar. were uniformly low, being above 30 in. on only three days, and the mean for the month has only once been lower during 40 years. The mean temp. is nearly two degrees below the average, and sunshine has been very deficient. Every month of the year shows a considerable increase of R over the average, the total excess for the four months being 6·50 in. Vegetation is unusually backward, and fully three weeks later than last year. Hardly a bud has burst on the horse chestnut or plane, while the beech, in full leaves at this period last year, shows no sign of foliage. Pastures made little progress. The wet weather retarded farm work of every nature.

EDINBURGH, BLACKET PLACE.—Westerly gale on 4th. Solar halos on 9th, 12th, 18th, 23rd, and 27th. Lunar halo on 18th. Slight S on 17th.

COLMONELL.—Rain 1·89 in. above, and mean temp. 0°·4 above, the average of 23 years.

TIGHNABRUAICH.—A cold and wet month. Very little growth in the fields.

MULL, QUINISH.—A very cold, wet month, from first to last. The wettest April on record since the gauge was established in 1874.

ABERDEEN, CRANFORD.—Wet and cold, with high winds from N., N.W., and N.E., and very little sunshine.

CAWDOR, BUDGATE.—S on 10th, 11th, 12th, 16th, 18th, 19th, 21st and 29th.

S. RONALDSHAY, ROEBERRY.—A wet and very cold month. Mean temp. 41°·3, or 2°·6 below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—One of the strongest N.W. gales remembered on the night of the 6th. Some frost at night in the middle of the month, and H showers in forenoon of 17th, but not measurable. Distant T on 14th.

WATERFORD, BROOK LODGE.—Max. range of temp. in 24 hours 24°·5. Fog on 2nd. Heavy gale on 7th. H shower on 14th. First pair of swallows on 17th. Thick sea fog on 24th.

BROADFORD, HURDLESTOWN.—A wet month on the whole. Rainfall ·81 in., and rainy days four, above the April average for 14 years. N.W. gale on 6th. S on 17th. T on 24th.

DUBLIN, FITZWILLIAM SQUARE.—A changeable, showery, and cloudy month. The wind was particularly variable in direction and force, and a prolonged series of gales was experienced from the 4th to the 8th inclusive. There was a cold spell from the 13th to the 19th. As in April, 1898, at the close many forest trees were in full leaf. Mean temp. 48°·6, or 0°·9 above the average. Fogs on four days. High winds on ten days, reaching the force of a gale on the 4th, 5th, 6th, 7th and 8th. Sleet on the 17th. H on 8th 14th and 17th. Solar halos on 3rd, 16th, 18th and 19th. Lunar halos on 18th and 19th. Slight T and L on the 25th.

WARINGSTOWN.—The wettest April since 1889.

OMAGH, EDENFEL.—By far the wettest April recorded here, the rainfall, largely in torrential showers, having been about 130 per cent. above the average of 35 years, saturating the soil and rendering it unfit for the reception of seed, except on high and dry situations. Although the mean temp. varied but little from the average, the atmosphere was in a very unsettled state, with frequent and considerable barometric and thermometric fluctuations occasioning abnormal cold and mildness within unusually short periods of time. Corncrake on 21st, swallows on 25th, cuckoo on 30th.

[VOL. XXXIV.]

THE NEW YORK PUBLIC LIBRARY

PRICE FOURPENCE,
Or 5s. per annum post free.

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
...ial Frost in the United States in February, 1899	65
...l Recurrence in Weather—a Lunar or 30-day period	68
...nford Earthquake of December 17th, 1898	70
...ake von Schriften und Karten über Meteorologie und ...Magnetismus. No. 12, Wetterprognosen	72
...	73
...	74
...t Worstead, March 20th, 1899	74
...Meteorological Observations at Camden Square during ...40 Years, 1858–97	75
...al Table for the British Empire, December, 1898	76
...ary Table of Rainfall, May, 1899	77
... Temperature in May, 1899, at 50 Stations	78
...al Notes on May, 1899	79

JUNE, 1899.

LONDON: EDWARD STANFORD,
COCKSPUR STREET, CHARING CROSS, S.W.

SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Roy
Meteorological Societies, and of the British Astronomical Association; Artic
by various eminent Astronomers, English, American, and Continenta
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assistan
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valua
publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory"
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 12s.

NOTICES.

It is requested that all Books for Review, and Communications fo
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in th
letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCI.] JUNE, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

UNPRECEDENTED FROST IN THE UNITED STATES IN FEBRUARY, 1899.

IN February, 1899, the contrast in temperature between the two sides of the Atlantic was probably greater than had occurred since the invention of the thermometer.

On February 10th, 1899, the shade temperature at Camden Square, London, rose to 64°·8, and there is no record of the heat in London in February exceeding 62°·5 during 104 previous years.

On February 12th–13th, 1899, the intensity of frost in the S. and S.E. of the United States was equally unprecedented; *e.g.*, 7° (25° below freezing) at New Orleans, on the Gulf of Mexico.

We have recently received the *Monthly Weather Review* for February, 1899, it is crammed with interesting facts, and the following extracts are but types of the mass which we have not space to reproduce.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

During the first half of February the most remarkable cold wave, or series of cold waves, in the history of the Weather Bureau traversed the United States from the north Pacific to the south Atlantic coasts, damaging crops and fruits in the Southern States to the extent of millions of dollars. During the first eight days of the month the lowest temperatures on record were reported at points in the north Pacific coast States; from the 9th to the 12th many places in the Central, Western, and North-Western States reported the coldest weather on record. During the 13th and 14th the cold wave overspread the Southern and Eastern States, attended (on the 13th) by the lowest temperatures on record from the southern Rocky Mountain slope to the south Atlantic coast, by zero temperatures to the Gulf coast of Alabama, and by a snowstorm of unprecedented severity in the Middle Atlantic States.

The visible cause of this period of intense cold is found in a series of barometric depressions in the South, combined with an area of high barometer of great magnitude which persistently occupied the British North-West Territory until the 11th, inclusive, when the highest sea-level pressure ever reported within the region of observation covered by the Weather Bureau and Canadian services (31·42 inches) was telegraphed from Swift Current, Assiniboia. After the 11th, this area of high barometer settled southward over the eastern Rocky Mountain slope and the central valleys, causing the severest winter weather ever experienced generally over the southern half of the country east of the Rocky Mountains. Ample and timely warning of the advance of the the cold wave was given to all interests that were likely to be injuriously affected by intense cold. It will also be noted that special reports and newspaper comments made in connection with the cold-wave visitation give unquestionable evidence that the warnings prompted protective measures, whereby crops, live stock, and perishable goods and merchandise to the value of hundreds of thousands of dollars were saved.

* * * * * * *

During the night of Sunday the 12-13th, the cold wave swept southward to the Gulf of Mexico, breaking all previous low-temperature records in the South and South-West, as shown in the following table:—

Station.	Lowest previous temperature recorded.	Minimum temperature February 13, 1899.	Departure below lowest previous temperature.
Concordia, Kans.	—25	—26	1
Dodge, Kans.	—20	—24	4
Wichita, Kans.	—14	—22	8
Oklahoma, Okla.	—11	—18	7
Amarillo, Tex.	—14	—16	2
Abilene, Tex.	— 5	— 6	1
Palestine, Tex.	— 1	— 4	3
San Antonio, Tex.	6	4	2
Galveston, Tex.	11	6	5
Springfield, Mo.	—17	—28	11
Little Rock, Ark.	— 5	—12	7
Nashville, Tenn.	—10	—12	2
Chattanooga, Tenn.	— 7	—10	3
Shreveport, La.	1	— 4	5
Vicksburg, Miss.	3	zero	3
New Orleans, La.	15	7	8
Mobile, Ala.	12	— 1	13
Montgomery, Ala.	5*	— 4*	8*
Atlanta, Ga.	— 2	— 6	4
Savannah, Ga.	12	8	4
Jacksonville, Fla.	14	10	4

* One of these figures must be erroneous.—Ed. *M.M.*

From Jacksonville, Florida, A. J. Mitchell, Local Forecast Official, Weather Bureau reported as under :—

Freezing conditions covered the territory set forth in the warnings, and ample time was given all interested to take the necessary precautions. The warning was telegraphed to 118 points, and every possible avenue was utilized to apprize the public of the expected severe weather. Railroads notified fruit and vegetable growers along their lines, cold-wave and frost signals were sounded by locomotives and river steamers, and along the 400 miles of the Florida Coast Line every section was promptly served. In the night of the 12th heavy sleet and snow prostrated telegraph lines north, and cut off communication with Washington, and on the 13th reports were not received in time to be of use. With a temperature of 10° at Jacksonville on the 13th, the official in charge sent the following warning throughout the central and southern portions of the State, the sections most vitally affected by a freeze at this time of the year : "*Severe freeze to-night throughout the Peninsula. Give widest possible distribution.*" The warning was lodged not only with every station and settlement, but special messengers were sent out by the Florida East Coast Line Railway notifying individuals throughout the extent of their lines. The action of this road was such that every point south of St. Augustine, except Key West, was notified. Other roads showed the same activity. The saving to fruit and vegetable growers was enormous. The methods of protection used, varied with the object to be protected. Orange trees were wrapped, banked, and some groves were covered. Additional protection was given by building fires. Pineapple fields were protected by a covering of lattice work under which fires were distributed. In every case through the north and north-central parts of the State the most heroic measures were necessary to save anything. The cold was so severe over the western, and parts of the northern, districts that cattle, horses and sheep died from exposure. The lowest temperature reported was 4° below zero over the western district. The temperature fell to 29° in the southern part of Dade County. The vegetable crop over central, northern and western portions of the State has been destroyed ; oats, peaches and pears damaged, and probably the greater portion of young citrus trees over the north-central counties has been seriously damaged. Citrus trees between latitudes 29° and 28° are thought not to be severely damaged, excepting young growth. Those south of the twenty-eighth parallel will escape with no serious consequences.

The total value of fruit, vegetables and property saved in Florida, as given by those who were benefited by the warnings, amounts to nearly $60,000. The figures are, however, necessarily incomplete, as many groves were saved whose values are not included in the above estimate.

It is a matter of sincere congratulation that, with the severest freeze in the history of the State, and with more property subject to loss or serious damage, the Weather Bureau so met the demands and expectations of the public that not one complaint has been received regarding the accuracy of the forecasts.

CHICAGO.

On account of the absence of snow the ground in the vicinity of Chicago was frozen in many places to the depth of five and one-half feet, causing great damage by the freezing up of the water and gas mains and service pipes. Plumbers have been unable to meet the damands for their services, and the

exigency has brought forth the novel method of thawing out frozen pipes by the use of an electric current. Great suffering was caused by the severe cold among the poorer classes, and many people were frozen to death. Several steamboats which maintain winter service on Lake Michigan were blocked by the thick ice and unable to reach port for three or four days.

THE MISSISSIPPI.

On February 6th, there was ½ inch of ice at Memphis, Tennessee; by the 13th this had increased to 1 inch, and had extended to New Orleans, where there were 2 inches, a record unparalleled in the history of the city, as far as is known.

ON A RECENT RECURRENCE IN WEATHER—A LUNAR OR 30-DAY PERIOD.

To the Editor of the Meteorological Magazine.

SIR,—I notice an article by Mr. Alexander MacDowall "On a Recent Recurrence in Weather," published in the March number of this Magazine (Vol. XXXIV., p. 20). For the purpose of comparison, I treated the temperatures observed at the Blue Hill Meteorological Observatory (near Boston, Mass., U.S.A.) exactly in the same manner as Mr. MacDowall treated the temperatures observed at Greenwich. That is, from July, 1898, to February, 1899, I took the average of the departures from normal temperature of each seven days having a new moon central, and the same for full moon. I next subtracted from the temperatures at new moon the temperatures at full moon in order to obtain the differences. The results are given in the following table:—

NEW MOON.	TEMPERATURE.		FULL MOON.	TEMPERATURE.		NEW MOON MINUS FULL MOON.	
	Green-wich.	Blue Hill		Green-wich.	Blue. Hill.	Green-wich.	Blue Hill.
Days.	°	°	Days.	°	°	°	°
July 18.....	+ 1·2	+ 3·3	July 3.....	—0·7	+ 6·1	+ 1·9	— 2·8
Aug. 17.....	+ 7·7	+ 3·1	Aug. 2	+0·4	+ 4·3	+ 7·3	— 1·2
Sept. 16.....	+ 7·1	+ 4·4	,, 31.....	+1·1	+ 9·0	+ 6·0	— 4·6
Oct. 15.....	+ 1·2	— 2·7	Sept. 29.....	—1·8	+ 6·3	+ 3·0	— 9·0
Nov. 14.....	+ 6·3	+ 1·6	Oct. 29.....	+5·9	+ 0·1	+ 0·4	+ 1·5
Dec. 13.....	+ 7·9	— 9·9	Nov. 28.....	+0·6	+ 7·7	+ 7·3	—17·6
Jan. 11.....	+ 7·0	— 5·7	Dec. 27.....	+4·8	+ 1·1	+ 5·2	— 6·8
Feb. 10.....	+11·9	—18·0	Jan. 26.....	—2·2	+11·4	+14·1	—29·4

The figures show that both at Greenwich and at Blue Hill the temperatures were generally above the normal until about November,

after which they were considerably below normal at Blue Hill at the time of new moon. But in the columns of temperature differences headed "New Moon minus Full Moon" a remarkable contrast is found between the temperatures at Greenwich and Blue Hill. At Greenwich the temperatures at new moon are steadily higher than at full moon, but at Blue Hill, with one exception, they were all lower. Furthermore, it is notable that the greatest plus departure at Greenwich (+14°·1) coincides with the greatest minus departure at Blue Hill (—29°·4); the next to the greatest plus departure at Greenwich (+7°·3) coincides with the next to the greatest minus departure at Blue Hill (—17°·6);* and the smallest plus departure at Greenwich (+0°·4) coincides with the only case in which there was no minus departure at Blue Hill. In other words, the reversal of phase was complete in almost every sense.

Another curious fact is, that the largest departures occurred in alternate months. Thus the alternate months August, October, December and February contain every case in which the departures exceeded seven degrees.

The mean departures from the normal temperatures at Blue Hill for each day of the weeks about new moon, first quarter, full moon and last quarter, from July, 1898, to February, 1899, are given in the following table:—

Mean Departures from Normal Temperature at Blue Hill, July, 1898, to February, 1899.

	New Moon.	First Quarter.	Full Moon.	Last Quarter.
	° F.	° F.	° F.	° F.
3 Days before	—0·5	+1 5	+4·1	+0·7
2 Days before	—0·9	+3·1	+2·7	+0·9
Day before	—4·8	+4·2	+0·1	+3·5
Day of	—6·8	+5·2	+4·2	+0·7
Day after	—5·9	+4·2	+3·4	+1·5
2 Days after	—2·3	+2·6	+0·9	—2·1
3 Days after	—0·6	+4·2	+3·1	—2·9

These figures show a well-marked period of about 30 days. The interval is too short to determine whether the period had the exact length of the lunar period or had any relation of cause and effect, although the presumption favors it. I showed in the *American Meteorological Journal* for June, 1895, that these thirty-day oscillations in temperature reversed in phase at any given place and oscillated in different phases at widely separated places, as shown above for Greenwich and Blue Hill (see *American Meteorological Journal*, Vol. II., p. 87; see also Vol. I., p. 528, for discussion of the same phenome-

[* But the other case of +7°·3 does not support the argument so well.—Ed.]

non in a two-year period). The reversal of phase at the same place is a curious phenomenon which at present completely blocks the way to forecasting. In some cases it appears to be due to a movement of the centres of oscillation, the laws of which will undoubtedly yield to further research. I have maintained for twenty years the paramount importance of a study of these periodic phenomena in order to advance in weather forecasting, but so far, I regret to say, I have not made many converts in America. I am glad that Mr. MacDowall is taking up the subject in England.

H. HELM CLAYTON.

Boston, Mass.

REVIEWS.

The Hereford Earthquake of December 17th, 1896, by CHARLES DAVISON, Sc.D., F.G.S. Birmingham, Cornish Brothers, 1899, 8vo., XIV.—304 pages, 22 maps and diagrams.

WE congratulate Dr. Davison upon having collected data respecting the above from 3,092 stations, and we think that perhaps he is still more to be congratulated upon having thoroughly digested this enormous mass of facts and impressions.

The record occupies the first 200 pages of the work. It is, a remarkable specimen of compact statement, is indispensable as the foundation for the second part, and (when one has thoroughly mastered the classification and the code of abbreviations) is easily followed, but at first sight the 3,092 entries (of which we take No. 1,000 as a type), are rather puzzling:—

1000. *Publow.*—Miss H. T. Bellamy.† **3.** 5.32. **4.** bed raised and shaken. **5.** ab. 20 secs. **6.** 5. **7.** no.

These two lines contain the following information from observer No. 1,000 at Publow, in Somersetshire. Miss H. T. Bellamy was awakened by the shock at 5.32 a.m., she felt her bed raised and shaken, she considered that the shock lasted about 20 seconds, that the intensity of the shock was 5 on the Rossi-Forel scale, but she heard no noise.

When one reflects upon the hundreds of pages which three thousand similar entries printed *in extenso* would have occupied, one sees that, though the first 200 pages may not look very inviting, no other course was practicable.

Having this enormous mass of information, Dr. Davison had to classify and to study it. He gives the results in chapters V. to XIII., but we think that it would be unfair to an author who has worked so hard, as in the present instance, for us to set out all the results at which he has arrived, or to say more than that those who are interested in the study of earthquakes ought to obtain a copy of this handsome and (as far as we have tested it), remarkably accur-

ately printed volume. We have not noticed a single misprint. The only part which seems to us rather weak is the artistic; the diagrams and maps, though no doubt correct, are not so explicit and clear as they might have been. We also think that the section upon previous shocks in Herefordshire might have been strengthened.

As regards the *time* of the shock, Dr. Davison has arrived at conclusions very closely accordant with those expressed in this Magazine (Jan. 1897, p. 181), where we said

TIME.

"Here, as in every previous earthquake, there is ample proof of the carelessness of most persons as to keeping accurate time, and of the tendency to quote round figures (*e.g.* 5.30 or 5.40), rather than accurate ones.

It will be for Dr. Davison, if he can, to bring order out of chaos; meanwhile we offer the following as our impression of what was the initial time of the disturbance—viz., 5.32 a.m.—and the rate of progress 30 miles per minute, from Hereford as a centre."

Dr. Davison seems to fix the centre as about 1 mile S.W. of Hereford (p. 225), the time as 5.31.45 a.m. (p. 275), and the mean surface velocity as 2,955 ft. per second (p. 274), which equals 34 miles per minute.

We are very glad to see how closely Dr. Davison's final results agree with our own very rough ones, determined from such information as we could collect within three weeks after the event; viz.: within 1 mile as to the centre, within 15 seconds as to time, and within 10 per cent. as to velocity of transmission.

It is satisfactory to find that the two important English earthquakes of recent years have been thoroughly investigated, and the results for each published. The former by Prof. Meldola, F.R.S., and Mr. White, in *The Essex Earthquake*, issued by The Essex Field Club, and the later in the work now before us.

One other monograph remains to be written: an exhaustive "List of British Earthquakes." All honour to the late Mr. Roper for his efforts in that direction; we drew attention to it when, after his death, his son showed filial affection and respect, by privately printing the MS. which his father did not live to complete. That work is an excellent foundation, but for such a book as we desire, it will be necessary to enlist the help of antiquarians, of the readers of *Notes and Queries*, of Parochial Clergy—especially of those of parishes with old Parish Registers,—it will need a seismologist, a geologist, and a draughtsman.

Such a work would not "pay;" the mere printing and publishing would probably cost £200 or £300, and therefore it could be done only as a "labour of love," but it would also be one of honour, and as regards the cost we believe that for a really useful object the funds can generally be obtained—as witnesses the work we are now reviewing.

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus, herausgegeben von Prof. Dr. G. HELLMANN. No. 12. Wetterprognosen u. Wetterberichte des XV. und XVI. Jahrhunderts. Berlin, A. Asher & Co., 4to., 1899, 34—184 pages, and seven folding sheets.

ENGLISH meteorologists who are unacquainted with the German language miss a great treat in not being able to follow the extremely learned and interesting series of publications of which No. 12 is now before us.

It deals with early weather almanacs, and with what we should call meteorological broad-sheets, *i.e.*, a sheet of paper of no uniform size but generally about 20 inches by 12 inches, printed on only one side, and usually with a large, coarse, wood-block representing "three sunnes," or an aurora, or other unusual appearance.

In the present volume we have reproductions (with an accuracy of which nothing but inspection can convey an idea) of a series containing 14 typical specimens of the weather almanacs (ranging from 1486 to 1899) and 12 of weather reports or broad-sheets.

These old publications were extremely numerous, at least 1,000 are known, so, possibly, the aggregate issue amounted to a million copies; but they were so rarely preserved that they are now nearly unobtainable, except at prices almost fabulous. Twenty years back, before Dr. Hellmann's work had directed attention to them, two were sold, one for 1,380 francs (£55) and the other for 680 francs (£27). This will give some idea of the money-value of the twenty-six reproduced in this volume. Added to which is the fact that many of the originals are in public libraries, whence no money could extract them, such as the National Museum, Nürnberg; the K. Library, München; the Bibliothéque National, Paris; and the British Museum.

We leave this question of money value, pointing out while so doing, that it at once puts out of the question all attempts at forming a *complete* meteorological library, and the hundreds of such publications of which every copy has perished, render it evidently equally impossible to form a *perfect* Bibliography of Meteorology.

These "Prognostica," as they are generally called, appear to have been among the early productions of the printing press; for Dr. Hellmann says that they appeared soon after 1470; but he does not give the title of any very early one, and the earliest which he reproduces is of 1486; this in no way contradicts his statement, for the probability of such a flimsy paper having been preserved for more than four centuries is not great. We wish, however, that he had stated the date and title of the earliest printed one known to him, and where it is.

We think that it would have been well that the Index should have stated in tabular form where the original of each of the 26 documents is preserved, For many of them this information is

given in the text, but for some we have not found it, and it would have saved time had all this information been given together.

As regards "Bauern Practica," which may be best rendered "Weather Almanacs," England was singularly behind the rest of Europe. Dr. Hellmann, with his unique knowledge and perseverance, has in this handsome—we might almost say priceless—volume given only one of English origin, viz., one issued for 1555 by A. Askham.*

BLACK RAIN.

To the Editor of the Meteorological Magazine.

SIR,—On Thursday, the 11th instant, we had a very heavy thunderstorm round Gloucester, but I think the storm was heaviest at Churchdown, between Gloucester and Cheltenham. There I have seldom seen so much rain fall within a limited time. The roads and ditches were watercourses in comparatively few minutes. What, however, I wish to mention to you is the fact that the rain seemed to be black. The ditches were quite inky in colour, and the puddles which remained in the road afterwards were also black. This was observed over a considerable district, and a number of people who caught water for household purposes were also struck with this peculiarity. The puddles which were left remained black for some days afterwards. Can you explain the phenomenon? The clouds were very black before the storm, but neither Gloucester nor Cheltenham produce any great amount of smoke. The course of the storm was from North-East to South-West., *i.e.*, from Cheltenham towards Gloucester. Perhaps you would reply to this in your Monthly Magazine, and this might save you the trouble of writing a reply.

I dare say you will allow me to insert it in the local papers, as a number of people in this locality would like to know your views about it.

Yours faithfully,

J. H. JONES.

Eldon Chambers, Gloucester, May 17th, 1899.

[We see that letters respecting the blackness of the rain on the above date appeared in the *Birmingham Daily Gazette* from correspondents at Upton-on-Severn, Staunton, Bromyard and Cheltenham. From this it is evident that the area affected included a triangle with Monmouth, Cheltenham and Bromyard for its three angles, say, an area of 500 square miles.

Many records of "black rain" have appeared in these pages, and we presume that until vigorous action is taken towards smoke abatement they will become more and more frequent. We cannot

* Wonderful to relate, the printer has put "Aksham" in the contents, and the Editor has not noticed it! A misprint in Dr. Hellmann's work is so rare that it has to be chronicled.

believe that it commercially "pays" to blow unconsumed carbon into the air, and we are certain that it is a nuisance.

There is no doubt whatever that smoke clouds from the manufacturing districts had been driven over Gloucester and Hereford, and the rain falling through, or from, them carried down the soot which they contained.—ED.]

OZONE.

To the Editor of the Meteorological Magazine.

SIR,—As I find that I am the only one reporting ozone to your *Met. Mag.*, I was pleased to read, and cannot forbear thanking you for, your interesting and instructive remarks on ozone on p. 50. Since you sent me "Hints to Meteorological Observers"—where I read that "the determination of ozone is not now included by the Royal Meteorological Society"—I have taken more notice of it myself, and wonder why others do not do so, for if not purely scientific from the mode of observation (*i.e.*, ozone papers), I can fully corroborate M. van Bastelaer's report, and have long since found out, that it is merely necessary to substitute the word "ozone" for the words "fresh air" to make the statements scientifically accurate.

I had for some time an ozonometer hanging up in a disused room, but never could find in it any indication of ozone, bearing out the statement that there is no "fresh"-ness in rooms.

When there is a period of a week or so without any ozone present here in the atmosphere, many people complain of want of energy and lassitude, but I myself know that the cause arises from a want of ozone to make the air "fresh."—I am, yours faithfully,

W. G. MACHIN.

Winchfield, May 17th, 1899.

WHIRLWIND AT WORSTEAD, MARCH 20TH, 1899.

To the Editor of the Meteorological Magazine.

SIR,—I have just seen the note in the May *Met. Mag. re* Whirlwind at Worstead.

I recorded T and L at 1.3 p.m., which confirms Mr. Preston—March 20th was a "funny" day. I found 7½ inches of snow on the level on measuring at 9 a.m. (and a neighbour's measurement agrees closely), but only 0·26 in. of water was recorded. All but a very little fell in the night. The snow plough visited us. A slight jump occurred in the barograph at 1.10 p.m., and the curve previously was slightly unsteady for some hours.—Yours faithfully,

E. T. DOWSON.

Geldeston, June 2nd, 1899.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

MAY.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	2·76	14	·94	0	52·2	48·5	80·6	68·1	34·8	43·4	..	..	..	..	5·7
1859..	2·13	12	·53	0	53·5	50·3	78·4	66·8	34·0	43·8	..	..	..	..	5·5
1860..	3·57	18	1·10	1	54·6	50·1	76·1	65·4	33·6	45·3	..	..	28·3	41·2	5·9
1861..	1·39	11	·58	0	52·8	49·0	80·8	64·9	30·0	43·6	..	..	23·5	38·8	6·2
1862..	3·06	16	·82	0	55·5	52·5	81·1	67·1	38·2	48·2	..	..	36·5	45·4	6·6
1863..	1·27	9	·27	0	52·1	48·9	79·4	65·1	32·2	42·9	..	..	27·4	39·7	4·7
1864..	1·86	10	·47	0	56·4	51·6	84·5	66·9	34·2	45·8	..	..	30·5	42·2	5·6
1865..	3·40	17	·75	0	56·5	52·6	81·0	69·2	31·9	46·4	..	..	28·6	42·9	5·0
1866..	2·03	10	·76	0	50·9	46·4	72·2	62·6	33·0	41·6	..	..	25·5	36·2	4·4
1867..	2·45	9	1·03	1	54·6	50·4	84·0	64·8	31·8	45·1	..	..	25·1	39·8	4·9
1868..	1·58	6	·93	0	58·6	54·4	87·6	70·4	35·6	47·9	..	..	32·2	42·5	5·2
1869..	3·27	17	·61	0	51·6	48·3	71·2	61·8	33·0	44·5	..	..	31·5	41·7	7·2
1870..	·70	6	·32	0	54·1	49·8	85·1	67·3	30·8	43·3	126·9	112·0	24·4	38·9	4·7
1871..	·92	7	·36	0	52·7	48·6	79·0	65·5	35·0	42·5	124·0	109·5	33·2	41·3	4·8
1872..	3·05	18	·73	0	52·1	48·6	75·9	62·9	33·2	43·6	127·8	107·6	29·0	40·5	6·1
1873..	1·56	14	·52	0	51·0	47·1	72·9	63·1	32·9	43·2	123·1	108·7	29·6	39·8	6·2
1874..	1·14	7	·66	0	51·5	47·3	73·9	63·2	33·3	42·5	120·8	107·0	28·0	39·3	5·9
1875..	1·61	13	·41	0	55·8	51·4	82·0	67·2	39·8	46·7	131·3	109·8	36·8	43·8	4·8
1876..	·94	6	·43	0	49·7	45·9	71·1	62·0	32·8	40·5	119·8	107·5	27·7	35·7	5·1
1877..	1·91	15	·28	0	50·2	46·3	68·0	59·8	29·2	42·1	121·0	101·0	25·7	39·2	6·6
1878..	3·89	19	1·71	1	55·0	52·0	74·9	65·8	36·7	48·4	122·4	107·6	36·6	46·2	6·7
1879..	3·46	19	1·30	1	49·2	45·6	69·0	59·3	30·6	41·4	122·4	105·3	25·4	37·6	6·2
1880..	·26	5	·21	0	52·6	47·7	85·0	65·2	33·8	43·4	131·5	110·8	30·0	39·0	5·6
1881..	1·52	11	·57	0	54·6	50·3	80·7	66·7	31·2	44·9	128·6	112·5	23·8	40·1	4·6
1882..	1·20	11	·41	0	54·9	50·0	74·2	66·9	37·3	45·5	129·7	114·0	32·8	40·5	4·8
1883..	1·97	11	·60	0	53·1	49·0	79·6	64·8	31·0	44·5	121·6	100·2	26·3	40·7	5·5
1884..	·78	11	·15	0	54·6	49·8	81·3	66·3	35·0	44·7	121·4	102·2	31·3	40·9	5·1
1885..	2·63	19	·39	0	49·9	46·1	73·8	59·7	31·1	42·2	119·3	101·8	26·9	37·5	5·8
1886..	4·79	19	1·27	2	53·0	48·9	75·3	62·9	31·6	44·6	115·8	94·8	23·7	39·5	5·8
1887..	1·45	21	·28	0	50·2	47·2	71·2	59·8	32·8	43·4	118·8	95·2	24·9	39·5	7·1
1888..	1·18	7	·33	0	53·1	48·2	77·2	64·0	35·3	44·1	125·3	105·8	29·3	38·8	4·9
1889..	3·22	14	1·08	1	56·1	53·0	81·2	66·2	42·7	49·3	125·9	101·2	32·8	46·9	6·2
1890..	1·25	13	·41	0	54·6	49·8	77·6	65·5	39·1	45·8	120·2	106·6	34·0	40·6	4·7
1891..	2·72	19	·66	0	50·3	46·7	80·2	60·5	30·7	43·0	122·7	98·7	28·0	38·9	6·8
1892..	1·51	11	·74	0	55·6	49·9	84·7	66·4	28·4	45·4	130·2	106·0	23·1	39·2	4·9
1893..	·80	8	·35	0	57·1	51·8	78·6	70·2	38·2	47·4	127·9	112·0	34·0	42·5	4·3
1894..	1·85	16	·41	0	50·7	46·4	71·5	61·0	33·0	42·4	116·9	105·0	25·0	37·2	5·7
1895..	·34	5	·12	0	55·6	50·5	86·2	68·3	35·7	46·0	128·9	109·3	30·2	41·5	3·8
1896..	·14	3	·12	0	54·5	49·1	78·9	67·2	36·1	45·2	122·9	110·2	25·6	38·9	4·3
1897..	1·08	9	·41	0	52·0	47·1	78·0	63·7	33·9	43·2	124·7	107·7	27·1	37·7	4·7
Mean ...	1·92	12	·60	0·2	53·3	49·2	78·1	64·7	33·8	44·4	124·0	106·1	28·8	40·3	5·5
Extremes {	4·79	21	1·71	2	58·6	54·4	87·6	70·4	42·7	49·3	131·5	114·0	36·8	46·9	7·2
	·14	3	·12	0	49·2	45·6	68·0	59·3	28·4	40·5	115·8	94·8	23·1	35·7	3·8

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1898.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	57·1	4	27·1	24	49·8	40·8	41·1	84	68·9	22·9	2·54	12	7·1
Malta	66·4	7	41·4	23	61·3	51·5	49·1	79	120·8	37·1	8·14	18	5·2
Cape of Good Hope	81·0	28	49·3	16	74·0	56·5	52·9	64	...	...	·44	4	2·8
Mauritius	86·6	6	68·3	14	83·8	72·5	68·1	74	137·4	60·1	5·70	12	5·8
Calcutta	81·6	14	51·4	5	77·5	56·7	55·2	67	138·4	41·5	·00	0	1·0
Bombay	89·3	18	64·0	29	85·6	72·4	67·6	69	137·3	55·9	·00	0	1·5
Ceylon, Colombo	92·4	18	70·8	10	88·7	72·8	71·8	81	154·0	68·6	3·05	17	5·7
Melbourne	109·4	5	44·0	1	78·7	54·5	49·5	57	158·2	36·9	·97	5	3·8
Adelaide	108·5	30	50·0	17	89·7	65·2	48·4	38	165·0	42·4	·53	2	2·3
Sydney	86·1	3	51·5	11	74·6	61·3	56·9	65	145·8	46·1	1·22	10	4·6
Wellington	77·3	11	47·0	25	69·4	55·1	50·8	67	138·0	37·0	2·71	14	4·2
Auckland	77·0	16*a*	53·0	3*c*	71·1	58·3	56·2	73	146·0	47·0	3·76	13	4·9
Jamaica, Kingston	89·9	1	65·9	20	87·0	68·8	66·0	76	...	...	·14	3	3·6
Trinidad	89·0	1, 5	60·0	4	86·7	68·3	70·5	82	161·0	60·0	3·57	11	—
Grenada	84·0	13*b*	71·0	15*d*	82·0	72·7	66·1	70	152·0	...	6·55	24	2·6
Toronto	44·8	30	—5·2	13	32·9	19·8	23·7	83	57·8	—8·0	2·35	13	7·8
New Brunswick, Fredericton	43·1	30	—17·5	16	28·4	9·8	11·3	75	...	...	2·29	17	6·6
Manitoba, Winnipeg	36·2	17	—34·6	31	15·1	—6·6	...	...	...	...	·61	6	3·6
British Columbia, Esquimalt	53·0	27	26·0	30	44·0	35·3	..	...	...	...	4·11	17	6·8

a—and 30. *b*—and 19. *c*—and 25. *d*—and 27.

Remarks.

Malta.—Adopted mean temp. 55°·9, or 0°·4 below, mean hourly velocity of wind 11·3 miles, or 0·2 above, average. Mean temp. of sea 65°·0. TS8 on seven days; L on three days and H on 23rd. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·4, of dew point 0°·1. and rainfall ·70 in., above their respective averages. Mean hourly velocity of wind 10·4 miles or 0·5 mile below average; extremes, 23·5 on 20th and 1·9 on 14th; prevailing direction E.S.E. to E. by N. L and T on 6th and 29th, and L on 16th and 28th. During heavy local rain on December 5th to 7th the seismograph was powerfully affected, the boom on the first two days going clean out of range to E., and on the third moving gradually to W. The rain on the two first days was generally from westward. T. F. Claxton.

Ceylon, Colombo.—Mean temp. of air 79°·5, or 0°·4 above, of dew point 0°·9 above, and rainfall 3·52 in. below, the average. Mean hourly velocity of wind 7·6 miles; prevailing direction N.W. and N.E. TS8 on 6 days and L on 6 other days. H. O. Barnard.

Adelaide.—A hot, dry month, the mean temp. being 5°·2 above the average of 41 years. Rainfall ·30 in. below average. C. Todd, F.R.S.

Sydney.—Temp. of air 1°·9 below, humidity 4°·5 below, and rainfall 1·42 in. below, the average. H. C. Russell, F.R.S.

Wellington.—Generally fine and pleasant, though showery during the middle and latter part of the month. Distant T on 18th. Prevailing wind from N.W., strong at times. Slight earth shock on 30th. R. B. Gore.

Auckland.—Rainfall rather more than an inch above the average of 30 years. Mean temp. slightly above the average. T. F. Cheeseman.

Jamaica, Kingston.—Rainfall only 7 per cent. of the average. Island rainfall 47 per cent. of the average. Mean hourly velocity of wind 1·6 miles. R. Johnstone.

Trinidad.—Rainfall 1·24 in. below the average of 30 years. J. H. Hart

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·81	XI.	Builth, Abergwesyn Vic.	5·26
II.	Dorking, Abinger Hall .	1·31	,,	Rhayader, Nantgwillt ...	3·82
,,	Birchington, Thor	2·48	,,	Lake Vyrnwy	3·68
,,	Hailsham	1·54	,,	Corwen, Rhug	2·02
,,	Ryde, Thornbrough	1·06	,,	Criccieth, Talarvor	3·77
,,	Emsworth, Redlands ...	·92	,,	I. of Man, Douglas	3·72
,,	Alton, Ashdell	1·20	XII.	Stoneykirk, Ardwell Ho.	3·90
III.	Oxford, Magdalen Col..	1·28	,,	New Galloway, Glenlee	5·07
,,	Banbury, Bloxham	1·45	,,	Moniaive, Maxwelton Ho.	4·80
,,	Northampton, Sedgebrook	1·41	,,	Lilliesleaf, Riddell	3·00
,,	Stamford, Duddington..	2·16	XIII.	N. Esk Res. [Penicuick]	3·75
,,	Alconbury	2·02	XIV.	Glasgow, Queen's Park..	4·45
,,	Wisbech, Bank House...	2·15	XV.	Inverary, Newtown	2·65
IV.	Southend	1·75	,,	Ballachulish, Ardsheal...	2·17
,,	Harlow, Sheering..... ...	3·00	,,	Islay, Gruinart School ...	1·48
,,	Colchester, Lexden	1·49	XVI.	Dollar.....	4·65
,,	Rendlesham Hall	2·05	,,	Balquhidder, Stronvar...	4·20
,,	Scole Rectory	2·15	,,	Coupar Angus Station...	3·78
,,	Swaffham	1·57	,,	Dalnaspidal H.R.S.....	...
V.	Salisbury, Alderbury ...	1·81	XVII.	Keith H.R.S.....	1·79
,,	Bishop's Cannings	2·64	,,	Forres H.R.S.	2·65
,,	Blandford, Whatcombe .	1·34	XVIII.	Fearn, Lower Pitkerrie..	1·96
,,	Ashburton, Holne Vic...	3·18	,,	S. Uist, Askernish	1·51
,,	Okehampton, Oaklands.	3·72	,,	Invergarry.....	1·91
,,	Hartland Abbey	2·47	,,	Aviemore H.R.S.	2·95
,,	Lynton, Glenthorne ...	3·43	,,	Loch Ness, Drumnadrochit	1·75
,,	Probus, Lamellyn	2·45	XIX.	Invershin	2·40
,,	Wellington, The Avenue	1·65	,,	Durness	...
,,	North Cadbury Rectory	1·22	,,	Watten H.R.S.....	2·18
VI.	Clifton, Pembroke Road	2·27	XX.	Dunmanway, Coolkelure	5·51
,,	Ross, The Graig	2·23	,,	Cork, Wellesley Terrace	3·95
,,	Wem, Clive Vicarage ...	2·50	,,	Killarney, Woodlawn ..	3·66
,,	Wolverhampton, Tettenhall	2·06	,,	Caher, Duneske	3·13
,,	Cheadle, The Heath Ho.	2·64	,,	Ballingarry, Hazelfort...	2·96
,,	Coventry, Priory Row ..	2·37	,,	Limerick, Kilcornan ...	1·42
VII.	Grantham, Stainby	2·36	,,	Miltown Malbay	2·78
,,	Horncastle, Bucknall ...	...	,,	Gorey, Courtown House	2·87
,,	Worksop, Hodsck Priory	2·82	XXI.	Moynalty, Westland ...	3·80
VIII.	Neston, Hinderton	2·09	,,	Athlone, Twyford	3·32
,,	Southport, Hesketh Park	2·39	,,	Mullingar, Belvedere ...	3·75
,,	Chatburn, Middlewood.	2·85	,,	Woodlawn	3·78
,,	Duddon Val., Seathwaite Vic.	6·34	XXII.	Crossmolina, Enniscoe ..	3·10
IX.	Melmerby, Baldersby ...	3·83	,,	Collooney, Markree Obs.	2·57
,,	Scarborough, Observat'y	3·33	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	4·30	,,	Warrenpoint.....	3·49
X.	Haltwhistle, Unthank...	2·39	XXIII.	Seaforde.....	3·93
,,	Bamburgh	3·16	,,	Belfast, Springfield	3·53
,,	Keswick, The Bank.....	4·37	,,	Bushmills, Dundarave..	3·04
XI.	Llanfrechfa Grange	3·29	,,	Stewartstown	3·96
,,	Llandovery	2·82	,,	Killybegs	2·46
,,	Castle Malgwyn	3·25	,,	Horn Head	2·72
,,	Brecknock, The Barracks	2·24	,,		

MAY, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. Nights below freezing in shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	1·38	— ·52	·40	14	12	74·2	31	34·4	5	0
II.		Tenterden	1·72	+ ·16	·69	22	11	71·5	31	32·0	26	1
"		Hartley Wintney	1·49	...	·37	16	13	74·0	31	28·0	5	2
III.		Hitchin	1·73	— ·22	·35	14	11	72·0	31	29·0	4	6
"		Winslow (Addington)	2·28	+ ·18	·59	12	14	72·0	31	31·0	4, 5	3
IV.		Bury St. Edmunds (Westley)	2·38	+ ·63	·74	12	12	67·0	18	31·0	5	...
"		Norwich (Brundall)	1·97	...	·40	24	16	69·0	18*a*	30·6	1	1
V.		Winterbourne Steepleton ...	1·44	...	·45	19	12	66·4	31	30·2	5	2
"		Torquay (Cary Green)	2·07	...	·46	19	12	65·4	8	41·9	4	0
"		Polapit Tamar [Launceston]..	3·62	+ 1·79	1·09	23	13	67·9	31	31·2	6	...
VI.		Stroud (Upfield)	2·75	+ ·71	·91	19	12	69·0	31	36·0	5	0
"		ChurchStretton(Woolstaston)	2·01	— ·86	·39	24	15	70·0	31	31·0	4	2
"		Worcester (Diglis Lock)	2·13	— ·15	·37	16	16	...	...	...	...	...
VII.		Boston	2·52	+ ·80	·47	8	13	75·0	31	30·0	5, 6	2
"		Hesley Hall [Tickhill].....	2·18	+ ·14	·50	15	16	75·0	31	29·0	5, 6	7
"		Breadsall Priory	2·92	...	·50	22	14	71·0	31	32·0	4*c*	4
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	4·23	+ 2·28	1·69	11	16	...	...	...	...	...
"		Skipton (Arncliffe)	4·46	+ ·74	1·17	11	15	...	...	...	...	...
"		Hull (Pearson Park).	3·33	+ 1·45	·79	15	18	70·0	30	30·0	5	3
X.		Newcastle (Town Moor)	3·59	+ 1·84	·85	11	17	...	...	...	...	...
"		Borrowdale (Seathwaite).....	8·78	+ ·17	2·47	19	16	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·84	— ·01	·80	19	15	...	...	...	...	...
"		Haverfordwest	2·43	+ ·07	1·01	19	15	68·9	30	33·3	27	0
"		Aberystwith (Gogerddan) ...	4·26	...	·95	21	16	73·0	31	...	...	...
"		Llandudno.....	2·26	+ ·33	·45	23	14	66·0	31	36·0	5	0
XII.	SCOTLAND.	Cargen [Dumfries]	4·11	+ 1·59	·98	18	9	69·0	31	30·0	4, 5	3
XIII.		Edinburgh (Blacket Place)...	3·80	...	1·25	19	15	70·8	31	33·2	6	0
XIV.		Colmonell	3·09	...	·96	18	9	71·0	29	28·0	3	...
XV.		Tighnabruaich	2·81	...	·75	19	12	66·0	31	32·0	3	1
"		Mull (Quinish).....	2·39	— ·56	·48	19	13	...	...	...	...	...
XVI.		Loch Leven Sluices	4·60	+ 2·04	1·50	20	12	...	...	...	...	...
"		Dundee (Eastern Necropolis)	4·00	+ 2·34	·95	18	16	73·0	31	32·7	8	0
XVII.		Braemar	3·05	+ ·64	·77	19	15	67·0	31	24·8	4	14
"		Aberdeen (Cranford)	3·26	...	·94	19	14	71·0	31	29·0	4*e*	8
"		Cawdor (Budgate)	2·57	+ ·82	·70	15	13	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·64	— ·45	1·02	17	6	...	...	...	...	...
"		Glencarron Lodge.....	4·55	...	1·51	16	14	65·9	8	30·1	3	5
XIX.		Dunrobin	2·53	+ ·43	1·13	15	7	65·0	31	33·0	4	0
"		S. Ronaldshay (Roeberry) ...	3·09	+ 1·37	1·23	15	11	62·0	29	35·0	3*f*	0
XX.	IRELAND.	Darrynane Abbey.....	2·55	...	1·34	17	13	...	...	...	...	...
"		Waterford (Brook Lodge) ...	3·74	+ 1·51	·58	9	16	66·0	30	33·0	15*d*	0
"		Broadford (Hurdlestown) ...	3·15	...	1·16	17	15	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·66	+ ·32	·59	19	13	...	...	...	...	...
"		Dublin (FitzWilliam Square)	2·09	+ ·16	·36	17	16	69·6	31	38·0	27	0
XXII.		Ballinasloe	2·90	+ ·21	1·03	17	14	71·0	31	38·0	6*g*	0
"		Clifden (Kylemore)	2·65	...	·63	19	11	...	...	...	...	...
XXIII		Waringstown	5·03	+ 2·59	·85	19	17	68·0	10*b*	29·0	6	5
"		Londonderry (Creggan Res.).	3·80	+ 1·28	·79	23	17	...	...	...	...	...
"		Omagh (Edenfel)	3·40	+ ·93	·84	23	16	69·0	31	32·0	3	1

+ Shows that the fall was above the average ; — that it was below it.

a—and 31. *b*—and 11, 12. *c*—and 5, 27, 28. *d*—and 27. *e*—and 5, 26.
f—and 24. *g*—and 7, 8.

METEOROLOGICAL NOTES ON MAY, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The first and last weeks were cold and dry. Showery from 13th to 16th, and from 19th to 24th. Heavy R on Whit Monday, 22nd, but very partial, 1·13 in. falling at Benenden, but none further S. Duration of sunshine 233 hours 40 mins. Bamboo and blue gum recovered from the March frost.

HARTLEY WINTNEY.—Much cold throughout the month, especially in the first and last weeks with strong N.E. winds; a sharp snap of frost from 26th to 30th damaging young shoots. The middle of the month was showery, but the total R is ·14 below the average. Distant T on 11th. 13 hours sunshine on 31st. Ozone on 14 days. Oak in leaf on 20th and ash on 31st.

WINSLOW, ADDINGTON.—A rather cold May with a good deal of R between the 8th and 24th, then very fine and bright to the end with slight morning frosts, but sharp enough to cut down potatoes and French beans. Heavy TS on 12th with heavy R, and H within a few miles; several accidents to sheep and cattle caused by the L.

WESTLEY, BURY ST. EDMUNDS.—A dull and unpleasant month and vegetation backward. Very cold from 4th to 6th. T on 8th, 19th, 22nd, and 23rd. TS on 15th. H on 8th.

NORWICH, BRUNDALL.—An ungenial month with much cold, harsh weather, rendering vegetation unusually late. R slightly over the average, and mean temp. about 2° deficient. The second May in succession with no max. temp. as high as 70°. Fine, dry, and much warmer towards the end. T and L from 5 to 6 p.m. on 15th, T at 4 p.m. on 16th, distant T on 20th, TS and heavy R at 3 p.m. on 24th.

WINTERBOURNE STEEPLETON.—Very cold and dull, the mean temp. being only 48°·9, or the lowest for May, except 1894, in seven years, and 2°·2 below the average.

TORQUAY, CARY GREEN.—R ·05 in. above the average. Mean temp. 52°·8, or 0°·4 below the average. Duration of sunshine 210 hours 50 min., being 14 hours 10 mins. below the average. No sunless day, the least duration being 10 mins. on 3rd, 19th, and 24th, and the greatest 14 hours 20 mins. on 31st, or 90 per cent. of the possible.

POLAPIT TAMAR [LAUNCESTON].—The early part of the month was fine and dry with cold nights and easterly winds. From 11th to 26th the weather was rough and cold with strong wind, heavy R and H. From 27th to the end finer with E. wind again.

STROUD, UPFIELD.—Heavy TS to the N. on 11th, but only a few drops of R here. S.W. gale on 18th.

WOOLSTASTON.—A very cold and backward month. Violent storms of H on 16th; mean temp. 50°·4.

BREADSALL PRIORY.—A very cold, sunless, and wet month.

HULL, PEARSON PARK.—TSS on 16th, 20th, and 23rd, with H on the latter day.

SEATHWAITE.—S on the mountains on 22nd.

WALES.

HAVERFORDWEST.—May was cold to the 7th, with ground frosts. From 7th to 26th R fell in small quantities nearly every day. From 26th to the end fine,

bright days, with low night temp., prevailed. Wind mostly N., N.E., and S.E. In 5 mins. at 1.30 a.m. on 17th ·10 in. of R fell, and at 3.15 a.m. on the same day there were violent squalls lasting from 10 to 15 mins. The oak was in leaf more than 15 days in advance of the ash.

GOGERDDAN.—The second and third weeks were very wet, but the last week was very hot, with bright sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—Except the last five days, when fine, warm weather prevailed, there was a continuance of the cold unsettled weather of April. Excessive R, low temp., and absence of sunshine having been the unusual concomitants of a bar. pressure somewhat above the average. The mean temp. was lower only in 1869, 1885, and 1894 during 40 years, and in only seven Mays was there a heavier R or less sunshine. Of the 4·11 in. of R 3·13 in. fell in the seven days, 17th to 23rd. E. winds prevailed on 21 days. The R for the first five months of the year is 24·47 in., exceeding the mean by upwards of 8 in., the fall in each month being in excess. Vegetation fully three weeks later than in 1898. T in afternoon on 1st. H showers on 16th.

EDINBURGH, BLACKET PLACE.—Very cold and wet. Mean temp. 3°·1 below, and R nearly double, the average. The fall on 19th, 1·25 in., is the greatest daily amount in May since 1865, and in 54 hours on 18th, 19th, and 20th, 2·09 in. fell. Fog on 10th.

COLMONELL.—R ·66 in. above, and mean temp. 2°·3 below, the average of 23 years. T on 1st and 15th. T and L on 16th.

TIGHNABRUAICH.—A cold, backward month, with small R. Prevailing winds E. and S.E., N. and N.W.

ABERDEEN CRANFORD.—Cold and wet, with N. and N.E. wind, and little sunshine.

S. RONALDSHAY, ROEBERRY.—The first half of the month was dry, the middle very wet and cold, the latter part drier and warmer. Mean temp. 45°·8, or 1°·6 below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—Fine on the whole, but heavy R on 17th and 18th. Heavy T with L on 10th, and T on 26th. The last few days very fine and warm. Total R for the first 5 months ·15 in. more than in 1898, but on 30 fewer days.

WATERFORD, BROOK LODGE.—T on 9th and 11th, H on 16th, fog on 21st.

BROADFORD, HURDLESTOWN.—A favourable month on the whole. The R of 17th, 1·16 in., is the greatest in 24 hours since July 24th, 1896, when 2·10 in. fell. R ·60 in. above, and rainy days 1 below, the average of 14 years.

DUBLIN, FITZWILLIAM SQUARE.—Both at the beginning and at the close fair, calm, anti-cyclonic weather prevailed; cold nights, and sunny, and sometimes warm, days. During the middle fortnight conditions were cyclonic, and the weather very disturbed, rainy and cold, R falling daily from 11th to 24th. Mean temp. 51°·4, or 0°·2 below the average. High winds on 6 days, never reaching the force of a gale. Fog on 10th, 12th, and 29th. H on 16th. T on 15th. Lunar corona on 20th. Solar halos on 1st, 17th and 29th.

WARINGSTOWN.—The wettest May since 1886.

OMAGH, EDENFEL.—The first week was fine and generally bright, with somewhat arid days and cold nights. In the fortnight that followed a R 50 per cent. above the average for the whole month fell, accompanied by a generally dark, raw, saturated atmosphere. The last week was brilliant, but without any real warmth till the last day.

No. CCCCII.] [PRICE FOURPENCE.
VOL. XXXIV. *Or 5s. per annum post free.*

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

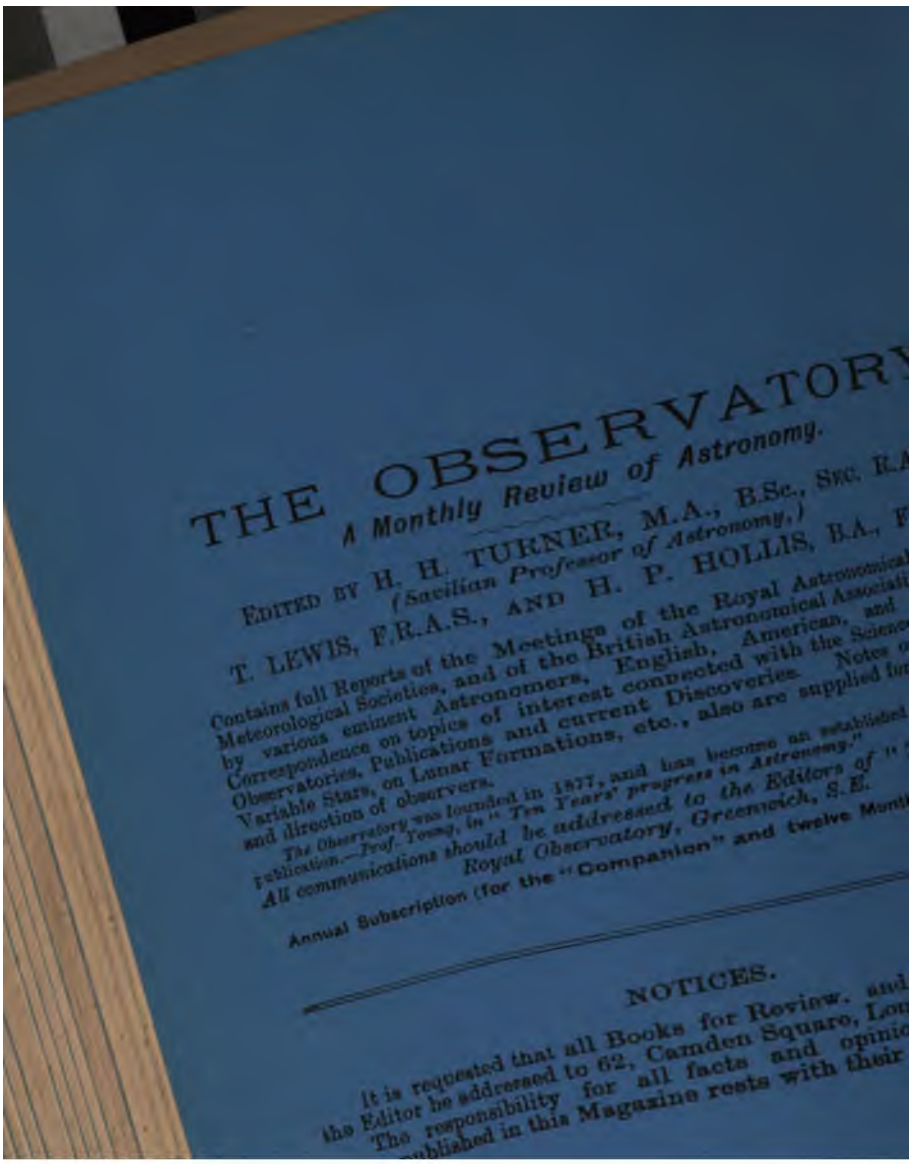
CONTENTS.

	PAGE
Meteorological Extremes	81
Effect of the Moon on Temperature	86
Lunar Halo	88
Royal Meteorological Society	89
Ozone	90
Results of Meteorological Observations at Camden Square during June for 40 Years, 1858–97	91
Climatological Table for the British Empire, January, 1899 ...	92
Supplementary Table of Rainfall, June, 1899	93
Rainfall and Temperature in June, 1899, at 50 Stations	94
Meteorological Notes on June, 1899	95

JULY, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.



THE OBSERVATORY

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A
(*Sacilian Professor of Astronomy,*)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F

Contains full Reports of the Meetings of the Royal Astronomical
Meteorological Societies, and of the British Astronomical Associati
by various eminent Astronomers, English, American, and
Correspondence on topics of interest connected with the Scienc
Observatories, Publications and current Discoveries. Notes o
Variable Stars, on Lunar Formations, etc., also are supplied fro
and direction of observers.

The Observatory was founded in 1877, and has become an established
Publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Month

NOTICES.

It is requested that all Books for Review, and
the Editor be addressed to 62, Camden Square, Lon
The responsibility for all facts and opinio
published in this Magazine rests with their

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCII.] JULY, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

METEOROLOGICAL EXTREMES.

INTRODUCTORY.

THE very remarkable record of barometric pressure which we quoted on page 66 (31·42 in.) has led one of our correspondents to suggest that it would be interesting to give in this Magazine a list of extremes, not merely of Pressure, but also of Temperature, Wind, Rain, &c. This is by no means easy. Information is widely scattered, in many languages, and in many books. The "infallible" Editor does not exist, and the inevitable result of the attempt will be the disproval and contradiction of many statements. But we wish for nothing but facts, and think that the more severe and the more widespread the criticism of the facts and opinions we put forth, the greater will be the advantage.

Desiring to avoid confusion, we intend to take one subject in each alternate month, leaving the intervening ones for the comment and criticism which we cordially invite.

PRESSURE.

Inasmuch as the barometric pressure is modified by the altitude above the earth's surface, it is obvious that for comparison, all records must be reduced to sea level. But for the benefit of those who have not thought much about the subject, we may mention that if the pressure at the level of the sea were 31 inches, it would be about 33 inches at the bottom of a mine 600 yards deep. Similarly when Messrs. Glaisher and Coxwell were at their greatest height (6 or 7 miles) in the balloon on September 5th, 1862, the barometer read only 7 inches, and in some of the recent experiments, when balloons have been sent up, carrying recording aneroids, *but no passengers*, the instruments have been recovered, indicating the following extremely low pressures: 1895, October 20, 4·33 in.; 1896, November 14, 4·45 in., and 1897, February 18, 4·02 in.

HIGH SEA LEVEL PRESSURES.

Leaving these artificially produced extremes, and taking records reduced to the mean level of the sea, we have collected the following paragraphs, and arranged them in the sequence of their publication:—

"*Extreme Fluctuations of the Barometer.*—The greatest height which

the barometer at Boston, U.S.A., has attained in 37 years is 31·125 in., and the least is 28·47 inches [1846, Nov. 25th]; the difference being 2·655 inches."—*Treatise on Meteorology*, by ELIAS LOOMIS, LL.D. (1880), page 21."

"In a letter to the *Times* (Jan. 18th, 1882), Mr. Symons quoted a reading at Greenwich Observatory on February 11th, 1849, which, reduced to sea-level, would be about 30·895 ins. (·080 in. lower than that of 1882), and adds:—Rather more than a century since, Sir George Shuckburgh (a remarkably accurate observer) is stated to have observed in 1778, 'the barometer in London at 30·935 inch, which he believed to be the greatest elevation ever seen.'"

"I do not know whence Belville quotes this statement, and it is not clear whether any corrections have been applied for temperature or for altitude. As the corrections would be of nearly equal amounts and of opposite sign, we shall, I think, be safe in assuming that 30·935 ins. was about the point reached in 1778." . . . .

"Belville gives a table of extreme pressures at Greenwich (not at the Royal Observatory), from 1811 to 1848, and from it, applying all necessary corrections, I find that on January 9th, 1825, the sea-level pressure recorded by Belville, reduced to sea-level, is 30·908 ins."

"In 1835 also, on January 2nd, the pressure recorded by Belville, reduced to sea-level, is 30·908 ins."

"In a leading article in *Nature*, of Jan. 26th, 1882, it is stated that readings of 31·046 ins. at 11 p.m. on January 8th, 1820, and of 31·007 ins. at 9 p.m. on February 24th, 1808, were observed at Gordon Castle, Banff, by Mr. James Roy; and it appears from the *Journal of the Scottish Meteorological Society*, that these observations were made with a barometer with a wooden scale, which is believed to have been fairly correct, though it would not now be accepted as a standard instrument."

"The reading of January 9th, 1820, is also supported by the following values, which I have reduced to sea-level as accurately as was possible without particulars of the exact position and external temperature:—Greenwich, 30·818 ins; Leith, 9 a.m., 31·065; Kinfauns, 9 a.m., 31·054 ins."

"M. Renou, in a note to the Paris Academy of Sciences, states that the maximum pressure at the Parc St. Maur was 786·92 mm. (30·981 ins.), at 10 a.m. on Jan. 17th, 1882, and adds that during nearly a century, only once has a pressure slightly exceeding this, been recorded at the Paris Observatory."

"On February 6th, 1821, at 9 a.m., the height was 787·52 mm. (31·004 ins.) and it would appear that at Paris, with these two exceptions, the barometer has during two centuries, never exceeded 785·1 mm. (30·910 ins)."

In an article in the *Zeitschrift der Oesterreichischen Gesellschaft fur Meteorologie*, Dr. Hann says: "The maximum pressure on Jan. 16th, 1882, at 10 a.m., 768·3 mm. (30·249 ins.) or 787·9 mm. (31·020 ins.)

at sea-level, is probably the highest in Vienna since 1775, for the sea-level pressure of 788·3 mm. (31·036 ins.) on Feb. 8th, 1821, cannot be relied upon as within ·01 in. or ·02 in. of the truth.

"With the exception of that occasion, the previous maximum sea-level pressure was only 785·6 mm. (30·930 ins.) on the 9th of January, 1859."—H. SOWERBY WALLIS, *Quar. Jour. Roy Met. Soc.*, Vol. viii. (1882), pp. 149–150.

"We have thus found that over Europasia areas of high pressure frequently cover a vast extent of territory; the barometer rises to a height unknown in any other part of the world, the thermometer sinks very low, and the centre of the high area—although it vibrates to-and-fro from day-to-day—appears to have no decided progressive motion.

"The highest pressure shown in Table LVIII. is 31·63 inches at Barnaul, and is the highest pressure at any of the stations reported in the *International Bulletin*.

"The number of Russian stations from which reports were received is only 22, whereas the number reported in the *Annalen des Physikalischen Central Observatoriums* is over 100, and one of these stations shows a pressure higher than Barnaul.

"At Ssemipalatinsk on December 16th, 1877, the pressure was 784·5 mm., which, reduced to sea-level (altitude 607 feet, and temperature —49° Cent.) amounts to 31·72 inches.

"This is the highest pressure I have found reported at any time for any part of the globe."—*Contributions to Meteorology*, by E. LOOMIS. 4to edition, 1887, p. 105.

"*High Pressures.*—Fort Conger, 31·00 in., March, 1883; "Jeannette," 31·09 in., 1880; Barnaul, 31·21 in., January 9th, 1877; Fort Assinaboine, 31·21 in., January 6th, 1886."—*American Weather*, by A. W. GREELY (1888), page 99.

"It may be of interest to add to these notes, as a supplement to Mr. Wallis's paper of 14 years' back, a notice of the excessive readings which have occurred in Siberia of late years. In vol. x. of the *Meteorologische Zeitschrift*, in the part for March, 1893, there is a note by our Honorary Member, Dr. Woeikof, on this subject.

"Herr Sresnewski had stated that on January 14th, 1893, a reading had been recorded at Irkutsk, which, when duly reduced, came to 807·2 mm., or 31·78 in. Dr. Woeikof disputes this statement, *inter alia*, because the temperature for reducing *up* to the freezing-point had been taken at —51°·34 F., and had been assumed to prevail from Irkutsk to the sea. He maintains that the reading of 803 mm., or 31·62 in., at Barnaul, December 14th, 1877, is really the best established barometrical maximum as yet on record.

"These readings, however, have been so much corrected, especially as to the reduction to sea-level, from stations some thousands of miles from the nearest sea, that they are not so easily intelligible as our own readings taken, so to speak, on the sea-shore.

"We can, however, feel pretty confident that as yet no reading of 32 in. has been registered.

"The highest sea-level pressures during January, 1896, given in the above paper are 31·108 in. at Ochtertyre, and 31·106 in. at Fort William."—Dr. R. H. SCOTT, *Quar. Jour., Roy. Met. Soc.*, Vol. xxii. (1896) p. 157.

Highest Pressures at Camden Square, 1858–99.

Above 30·750 inches.

			in.				in.
1859	Jan. 9,	11.4 p.m.	30·830	1882	Jan. 18,	10.30 a.m.	30·975
1865	Dec. 15,	9.0 ,,	30·782	1886	Feb. 8,	9. 0 p.m.	30·751
1867	Mar. 2,	9.0 a.m.	30·788	1893	Dec. 30,	1.50 a.m.	30·772
1873	Feb. 18,	11.0 ,,	30·846	1896	Jan. 9,	9. 0 p.m.	30·934
1879	Dec. 23,	10.0 ,,	30·813	,,	,, 30,	11. 0 a.m.	30·927

As regards the recent case in the N.W. of America, we have the precise figures only for the station at Swift Current, but the chart reproduced in the *Weather Review* shows that at 8 a.m. on February 11th, 1899, the isobar of 31·0 inches started N. of Fort Garry in 98° W. and 48° N., went nearly due S., between Lincoln and Topeka, then turned westward between Denver and Cheyenne, and went N.-Westward to a point in 117° W., and 48° N; it therefore included a vast area about 8° by 20°, and the records from the surrounding stations amply support the highest reading of 31·42 in., at Swift Current, Assiniboia.

It will be seen from the extract above given from General Greely's *American Weather*, and it is further proved by a table of 81 instances of pressures exceeding 31 inches reported during seven years (1877–84), given by Loomis, that Assiniboia is a locality in which these extreme pressures are comparatively frequent.

Instances of Sea-Level Pressures exceeding 31 *inches.*

[This list is far from complete as there must be several hundred such records, but these have been selected partly for extreme height, and partly for rarity in the respective localities.]

	° ′	° ′				in.
Irkutsk	52 20 N.	104 36 E.	1893	Jan. 14	...	31·780
Ssemipalatinsk	50 33 N.	80 36 E.	1877	Dec. 16	...	31·720
Barnaul	53 14 N.	83 22 E.	,,	,, 14	...	31·620
Swift Current	50 30 N.	108 15 W.	1899	Feb. 14	8 a.m.	31·420
Barnaul	53 14 N.	83 22 E.	1877	Jan. 9	...	31·210
Fort Assinaboine..	50 12 N.	100 30 W.	1886	,, 6	...	31·210
Boston, U.S.A.	42 20 N.	71 18 W.	Before 1880		...	31·125
Ochtertyre	56 24 N.	3 53 W.	1896	Jan. 9	9 a.m.	31·108
Fort William	56 48 N.	5 5 W.	,,	,, ,,	10.12 a.m.	31·106
"Jeanette"	In Arctic Regions.		1880	...	...	31·090
Leith	55 58 N.	3 10 W.	1820	Jan. 9	9 a.m.	31·065
Kinfauns Castle	56 23 N.	3 20 W.	,,	,, ,,	9 ,,	31·056
Gordon Castle	57 38 N.	3 4 W.	,,	,, 8	11 p.m.	31·046
Vienna	48 13 N.	16 22 E.	1821	Feb. 8	..	31·036
,,	,,	,,	1882	Jan. 16	10 a.m.	31·020
,,	,,	,,	,,	,, 17	7 ,,	31·012
Gordon Castle	57 38 N.	3 4 W.	1808	Feb. 24	9 p.m.	31·007
Paris	48 50 N.	2 20 E.	1821	,, 6	...	31·004

Low Pressure.

"At Unalaska, January 21st, 1879, a reading of 27·70 was noted, and at Stykkisholm 27·91 was recorded February 1st, 1877.

Even more remarkable readings have been noted in connection with the typhoons of the China Sea and the cyclonic storms of the Atlantic. On September 27th, 1880, the ship "Chateaubriand," in 22° N., 121° E., near Grand Turk Island, experienced a violent typhoon, during which the barometer sank in four hours from 29·64 to the unprecedented point of 27·04. Wind of force 12, from the northwest, was followed by a dead calm, and then by south and south-east winds, force 12, thus showing that the vessel was in the centre of the typhoon."—*American Weather*, by A. W. Greely, p. 97.

"Mr. Blanford, in a communication to *Nature*, vol. 35, p. 344, dated January 6th, 1887, referring to the reading of 27·332 ins. (reduced to sea-level) at Ochtertyre, which was quoted as the lowest reading observed by man anywhere on the land surface of the globe, states that 'the cyclone, which on the morning of September 22nd, 1885, swept over False Point, on the cost of Orissa, gave the lower reading 27·135 ins., at the beginning of the central calm, and 27·154 ins. half an hour later (both readings reduced to 32° and sea-level).'

The readings are shown by Mr. Blanford to be thoroughly authentic, and were made by a verified Standard barometer.

For comparison with English Standards, a further subtractive correction of ·011 in. has to be applied, which would make the lowest reading 27·124 ins."—C. Harding, in *Quar. Jour., Roy. Met. Soc.*, Vol. xiii, 1887, p. 212.

Lowest Sea-Level Pressures at Greenwich, 1811—1884.

Below 28·600 inches.

			in.				in.
1812	Oct. 19,	6.0 p.m.	28·542	1847	Dec. 7,	2.30 a.m.	28·550
1814	Jan. 29,	5.0 ,,	28·233	1848	Feb. 26,	9.45 ,,	28·469
1817	Dec. 8,	—	28·532	1865	Jan. 14,	11.55 ,,	28·560
1818	Mar. 4,	night	28·530	1872	,, 24,	5.20 ,,	28·380
1821	Dec. 25,	5.0 a.m.	28·016	1873	,, 19,	10.30 p.m.	28·453
1824	Nov. 23,	—	28·484	1876	Dec. 4,	11.0 a.m.	28·407
1843	Jan. 13,	0.53 p.m.	28·266	1884	Jan. 26,	7.35 p.m.	28·520

W. Marriott, *Quar. Jour., Roy. Met. Soc.*, vol x., 1884, p. 121.

Lowest Pressures at Camden Square, London, 1858—99.

Below 28·600 inches.

			in.				in.
1865	Jan. 14,	11.30 a.m.	28·557	1884	Jan. 26,	7.30 p.m.	28·529
1872	,, 24,	4.47 ,,	28·332	1886	Dec. 9,	4.45 a.m.	28·295
1873	,, 20,	1.0 ,,	28·447	1891	Nov. 11,	11.45 ,,	28·456
1876	Mar. 12,	0.30 p.m.	28·447	1893	Dec. 20,	5.0 p.m.	28·565
,,	Dec. 4,	11.0 ,,	28·364	1896	,, 5,	1.11 a.m.	28·515

Rapid Fall of Barometer.

"Thus during the hurricane which devastated Guadaloupe on the 6th September, 1865, it is stated in the *Bulletin International* that the barometer at Marie Galante, a neighbouring island, was 29·929 inches at 4 a.m., 29·646 at 6.30 a.m., 29·174 at 6.47 a.m., and 27·953 at 7.40 a.m., having thus fallen 1·693 inches in one hour and ten minutes!"—*Handy Book of Meteorology.* By Alexander Buchan. 1868.

EFFECT OF THE MOON ON TEMPERATURE.

To the Editor of the Meteorological Magazine.

Sir,—In the March and June numbers there are articles on the effect of the moon on temperature at Greenwich, England, and Blue Hill, Mass., giving figures showing a most extraordinary effect from the moon, and in opposite directions at the two places. Oftentimes it seems best to let errors go, as they will be righted sometime; but these articles are so extremely wild that forebearance ceases to be a virtue. Leaving out the question whether a dead moon can influence the earth's temperature in any way. Furthermore, ignoring the most careful experiments of Lord Rosse with his big reflector, in which he showed that, if anything, the earth receives a slight cooling from the full moon, also omitting the still later bolometric work on the moon, in which it was shown that it gives just the least bit of heat to the earth, is it possible to reason as to the manner in which the moon must affect the earth if at all? Is it not impossible to consider that the moon can have a tendency to heat the earth at one time and at another to cool it? Is it possible to assume that the moon can cool one part of the earth in its apparent diurnal motion and can heat another part at the same time? An answer to these two questions gives the death blow to all researches of the kind here published.

The inquiry remains, how can such remarkable statistics as those given be explained if they are of no value. We have a familiar saw in this country "figures can't lie," and there are a great many people, and some scientists, who believe that all that is necessary is to turn a mass of statistics into a machine and grind out the results. The present case is a fine example of the utter futility of such methods of work. In all studies of meteorologic data for relationships, there are, at least, three absolutely essential conditions to be observed:—

1. The data must be sufficiently abundant to establish a law.
2. It is very essential to be able to show *a priori* how such a law or relationship can come about.
3. The data must be homogeneous, that is, all sources of modification or variation must be first eliminated before research on a suspected law can be begun.

Now these three principles have been grossly neglected in the above discussion.

The following examples may make these points clearer :—

1. It is related of Sir Isaac Newton that,—one day driving with a friend, he passed a shepherd boy tending his flock. The boy warned him of an impending storm, though the sky was without a cloud ; and sure enough, within two hours, a heavy storm came up, and the two were drenched. The next day the philosopher approached the boy, hoping to get the secret of his remarkable prophecy. It was only after a guinea rested in the boy's palm that he ventured to impart his secret. "Do you see that old black sheep in the flock ? Well, when he turns his nose into the wind, shakes his head, stamps his foot, and wags his tail, it will surely rain within two hours."

2. The ancients were perfectly justified by statistics and coincidences, in teaching that the earth was stationary and the whole universe revolved about it. Millions upon millions of such statistics could not establish the true law.

3. Statistics have been massed to show that there are more deaths among adults in winter than in summer, and some have taught that cold is inimical to good health. It has also been stated that convicts in prison have greater weight in summer than in winter. On the other hand, it is almost the universal testimony that cold air is invigorating, and certainly much better work is done in the cold season than in the warm. If such statistics were properly studied and arranged, it would be found that it is not the cold air that causes sickness in winter, but carelessness and exposure. The reason convicts weigh less in winter is because of confinement in closed cells, while in summer regular out-door exercise, and a better diet, increases their weight. Most everyone weighs more in winter than in summer.

Taking the case before us, we find (1), all efforts to establish such a law in the past have failed whenever enough statistics have been massed. Take, for example, the data at Boston, Mass., very near Blue Hill, for 1898 and 1899, to the present time, 18 lunations. I will give the figures as arranged by Mr. Clayton, that is, I will subtract the temperature at full from that at new moon :—

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
+3°	+4°	−8°	+4°	+8°	+7°	−1°	−4°	−4°	−10°	+2°	−6°	−6°	−19°	−1°	+1°	+1°	+5°

It will be seen that the figures between the dark lines, or from the 7th to the 14th lunations, are almost the same as those given for the same period at Blue Hill. Even in this short interval, we see that there are just as many plus departures as minus, though, if we pick out the eight given by Mr. Clayton, we shall find 88 % in favour of the view that the full moon heats the earth. (2), We have already seen that *a priori* reasoning establishes the fact that the moon can have no effect upon temperature. (3). Changes in temperature are due entirely to the progress of high and low pressure areas, to the clearness or cloudiness of the sky, and to several other conditions, not clearly understood. Take the enormous difference of 29°, given

by Mr. Clayton, for the February lunation. During those seven days, the eastern United States had one of the severest cold waves ever experienced, and the fall in temperature was due to this cold wave, and in no manner whatsoever to the moon. In addition it may be said the figures given at Greenwich and Blue Hill really prove too much. Everyone knows that the moon cannot have so marked an effect.

H. A. HAZEN.

Washington, D.C., U.S.A.

LUNAR HALO.

To the Editor of the Meteorological Magazine.

SIR,—Last night (April 18th), between 9 and 9.30 p.m., I saw what I venture to think is rather an unusual form of lunar halo.

There was, in the first place, the upper half *only* of the usual primary halo, extremely bright and clearly defined. I measured this roughly with the finder of my telescope, and made the inner edge at the highest part to be about 21° above the moon. At this point, and for some distance on each side of it, there were distinct traces of a reddish-brown tinge of colour (also on the inner edge, which just touched the star a Lyncis). At the points east and west of the moon, where you would expect mock moons to form, and where they are shown on Mr. Stow's engraving, there was a slight brightening and a good deal of scattered light; from these points there stretched a circle entirely round the heavens, apparently at the same altitude above the horizon as the moon, the only part wanting being that within the circumference of the primary halo. Following round by the south from the S.W., this large halo passed just below Arcturus, above γ and β Draconis, but below θ of the same constellation, then about 8° below the Pole star, and finally over β Aurigæ. About 9.20 p.m. in that part of the heavens opposite the moon, this halo became very bright, almost as much so as the primary halo, but I could not detect any colour. If I am correct in my estimate that at 9.20 p.m. the large halo passed 8° below the Pole, this would make the altitude about 45° above the horizon all round.

On referring to notices of lunar halos in the *Met. Mag.*, I find that this must be the same halo as that described in Vol. IV., p. 145, but Mr. Stow appears to have seen only a comparatively small part of it.

Everything disappeared shortly after 9.30 p.m., but at 11.15 p.m. the primary halo was again seen (this time complete, though much fainter), but no trace of the large halo.

I am, yours sincerely,

CHARLES L. BROOK.

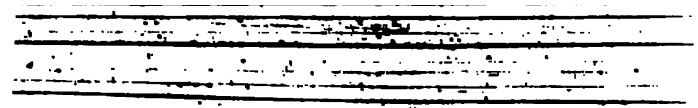
Harewood Lodge, Meltham, April 19th, 1899.

[It is not easy to arrange a view of the phenomenon which goes

HALOS AND PARASELENÆ SEEN AT HAWSKER, NEAR WHITBY,
By the Rev. F. W. Stow, 9.45 p.m., Oct. 15th, 1869.

Reprinted from *Meteorological Magazine*, November, 1869.]

[See page 88.



"entirely round the heavens;" therefore, instead of attempting to do so, we reprint the engraving to which Mr. Brook refers. It, and his carefully-worded description, will, we think, convey to everyone an accurate idea of the phenomenon he was so fortunate as to see. The explanation of the formation of this horizontal white band was given by Mr. Cherrill in *Met. Mag.*, XXVI. (1891), p. 69.—ED.]

ROYAL METEOROLOGICAL SOCIETY.

The last Monthly Meeting of the present session was held on Wednesday afternoon, June 21st, at the Society's new rooms, 70, Victoria Street, Westminster. Mr. F. C. Bayard, LL.M., President, in the chair.

The following gentlemen were elected Fellows:—H. O. Barnard, Surveyor Generals' Office, Colombo, Ceylon; Augustine Marshall, M.D., 145, London Road South, Lowestoft; Captain R. H. Potter, 6, Alwin Street, Aigburth Road, Liverpool.

Dr. R. H. Scott, F.R.S., read a paper on the heavy falls of rain recorded at the seven Observatories connected with the Meteorological Office during the 28 years, 1871—98. The data have been derived from the records of the Beckley self-recording rain gauges at the following places:—Valencia, Armagh, Glasgow, Aberdeen, Falmouth, Stonyhurst, and Kew. These records have been tabulated for each hour, and it is from these hourly tabulations that Dr. Scott has extracted the heavy falls. He finds that Falmouth has the greatest frequency of heavy falls, the next station being Valencia, and then Stonyhurst. The most exceptional fall during the whole period was at Glasgow, at 5 p.m. on August 11th, 1895, when as much as 0·80 in. was collected in ten minutes. The information given in this paper is likely to be of much service to engineers who want to know the rate at which rain sometimes falls for short periods.

A paper by Mr. J. Baxendell, describing his new self-recording Anemoscope, was read by the Secretary. This instrument, which records the direction of the wind on an open scale, has been in use at Southport for more than a year, and works very satisfactorily. The vane, which is an exceedingly light, but large double-bladed one, is sensitive even in light airs, and steady in the strongest gales. The records from this Anemoscope, which were exhibited at the meeting, were very clear, of an interesting character, and showed the instrument to be a valuable companion to the Dines pressure tube anemometer.

A paper by Mr. R. C. Mossman, F.R.S.E., on the average height of the barometer in London was also read by the Secretary. Some years ago Mr. H. S. Eaton worked out the mean monthly and annual height of the barometer in London for 100 years. Mr. Mossman has carried on this discussion for a further period of 20 years, but he finds that the results for the 120 years are practically identical with those for 100 years.

OZONE.

To the Editor of the Meteorological Magazine.

SIR,—Your effort to revive observations on ozone will, I think, be gratifying to old-fashioned meteorologists. I was very glad to see the article on this subject in the May No. of the *Met. Mag.* (p. 50), also Mr. Machin's letter in the June No.; this writer states that he is "the only one reporting ozone to your *Met. Mag.*", but I fail to find his records, and should be pleased to see what he has reported.

Twenty years ago I registered ozone here, at Lowestoft, and used Schönbein's tests, I had good results; but as the Roy. Met. Soc. did not include that element in the Report (this station was adopted by the Society as one of the "Second Order"), I let the matter slide.

Twelve months ago I made a fresh start, using Dr. Moffat's tests, scale (0—10), and append the *means* for the six months of 1899 :—

Jan. ...	5·4	Feb. ...	4·2	Mar. ..	5·1
April ...	5·6	May ...	5·4	June ...	5·3

I know of no records with which to compare these means, except the few in Mr. Glaisher's Reports to the Registrar General.

I noticed that ozone was entirely absent here from the 7th to the 11th of January, and I noted that a large fire at a timber yard, 1¼ mile distant, just S.W. of this Station, occurred on the 7th of January,—which seemed to have burnt out all the ozone (or while the débris was smouldering, the fumes neutralized it); the wind being S.W., except for a short time it was S.S.E., and then I found 1 on the scale.

Generally, I observe the largest amount when the wind is from the sea, i.e., between N. and S.S.E. But I think results should be collated not only with the direction of wind, but also with hygrometric conditions.

There was a drought here from May 26th to June 18th (only 0·01 in. on June 10th), but ozone was manifest every day, ranging between 4 and 8, the mean being 5·3 for the 22 days. Sea breezes prevailed.

I do not know whether we possess, in this country, the necessary records for a thorough discussion.

Yours faithfully,

SAM. H. MILLER.

Lowestoft, July, 1899.

[Mr. Miller seems to have overlooked Mr. Machin's "Remarks" on each month, but the mean amount should be given as well as the frequency. Probably the best plan would be for those who would like to co-operate to intimate the fact, and if the wish seemed sufficiently supported, the Council of the Roy. Met. Soc. might be asked to nominate a Committee to consider and advise upon the subject; for if observations are to be resumed, several points must be considered so as to ensure the closest possible approach to uniformity.—ED.]

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

JUNE.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	·92	5	·59	0	65·8	61·0	92·6	79·1	46·1	55·1	..	..	..	..	4·1
1859..	2·90	12	1·01	1	62·4	58·6	80·8	73·8	44·9	53·3	..	..	..	..	6·0
1860..	5·47	25	·87	0	55·6	52·4	71·9	64·7	43·4	49·6	..	..	36·3	47·0	7·6
1861..	2·13	17	·39	0	60·1	57·0	83·6	71·2	42·0	50·9	..	..	39·1	47·7	5·4
1862..	2·43	17	·53	0	56·9	53·2	76·8	67·5	42·7	49·4	..	..	37·8	46·7	5·8
1863..	4·86	15	1·55	2	58·8	55·7	80·9	70·4	40·8	49·6	..	..	40·9	48·0	6·2
1864..	1·28	14	·35	0	58·4	54·1	78·2	70·5	42·7	50·2	..	..	40·1	46·9	5·5
1865..	2·21	5	·64	0	60·6	55·9	88·2	75·2	41·8	51·3	..	..	36·9	47·6	4·2
1866..	3·98	12	1·33	1	61·5	57·8	86·1	73·5	42·1	52·4	..	..	36·8	48·3	4·2
1867..	1·22	6	·74	0	59·6	55·0	82·5	70·8	42·8	53·6	..	..	35·1	43·6	5·7
1868..	·78	4	·25	0	63·6	57·8	87·8	75·5	44·6	51·5	..	..	37·4	45·3	3·5
1869..	1·03	6	·47	0	57·1	52·2	89·3	68·6	35·6	46·9	..	..	32·8	43·4	5·1
1870..	·83	4	·49	0	61·7	55·6	91·2	75·4	43·5	51·4	136·8	120·4	..	..	4·7
1871..	3·49	16	·67	0	55·4	52·6	76·0	66·8	39·0	48·3	123·6	110·4	37·2	47·8	6·7
1872..	2·55	15	·58	0	60·7	55·8	85·9	71·7	40·6	50·1	130·5	115·0	38·8	48·2	5·3
1873..	2·24	11	·69	0	59·6	55·7	79·2	70·7	42·3	51·1	131·8	114·8	39·2	48·7	6·5
1874..	2·05	12	·72	0	58·9	53·8	81·7	70·8	39·5	49·4	129·0	116·3	34·6	46·8	5·7
1875..	2·40	15	·56	0	59·9	55·4	85·1	72·3	43·3	50·9	127·9	115·9	42·0	48·5	6·0
1876..	1·27	11	·44	0	59·5	55·0	84·8	71·0	39·4	50·3	129·9	112·2	34·6	47·3	5·9
1877..	·42	6	·21	0	63·0	57·1	84·7	75·3	44·7	52·3	131·0	118·3	38·9	47·5	3·7
1878..	6·71	15	3·28	2	60·9	56·9	86·5	71·7	41·6	51·6	129·6	112·3	41·2	48·8	5·8
1879..	4·76	22	1·07	1	57·4	54·2	74·0	67·1	40·6	50·6	131·6	112·3	37·1	47·1	6·7
1880..	4·04	17	1·13	1	57·6	54·1	79·8	69·1	38·3	50·1	133·7	113·4	34·2	46·1	7·0
1881..	1·72	10	·58	0	59·6	54·4	82·7	70·6	37·4	50·4	131·3	115·9	34·5	46·5	6·2
1882..	2·30	18	·41	0	57·4	53·0	74·3	66·8	41·5	49·4	130·0	111·1	36·9	46·5	6·7
1883..	1·35	12	·49	0	59·7	54·8	85·6	71·4	41·3	50·4	125·5	111·2	36·8	46·6	5·7
1884..	2·84	7	1·47	2	58·7	54·4	81·7	69·9	40·6	50·0	120·6	107·3	31·0	45·7	6·3
1885..	1·99	11	·79	0	59·6	54·3	84·7	70·9	41·4	50·7	127·4	108·4	36·4	47·2	4·9
1886..	·63	8	·25	0	57·6	52·5	80·2	69·6	40·2	49·2	127·7	112·5	36·0	44·7	5·3
1887..	·91	3	·51	0	60·9	56·0	85·3	73·8	43·0	51·3	130·4	114·0	38·2	47·4	4·6
1888..	2·31	20	·60	0	57·8	54·0	84·7	68·1	43·9	50·8	127·6	106·9	36·7	47·4	6·9
1889..	2·03	6	·61	0	61·1	56·9	84·5	72·7	46·9	53·4	126·3	110·0	39·6	49·9	5·5
1890..	2·82	17	·53	0	58·3	54·0	78·2	69·0	40·8	50·9	124·8	109·7	36·9	48·0	6·4
1891..	·86	10	·32	0	60·3	55·8	79·0	71·5	44·9	52·2	125·9	114·8	38·9	48·9	5·4
1892..	2·46	13	·71	0	58·2	53·4	82·7	69·6	38·6	49·6	129·6	115·4	31·9	44·6	5·3
1893..	·73	9	·24	0	61·2	55·1	90·4	74·9	38·3	51·4	134·3	116·4	35·0	47·1	4·5
1894..	1·84	12	·43	0	58·9	54·8	83·8	68·9	43·7	50·6	125·9	108·3	36·6	46·3	5·8
1895..	·30	4	·20	0	61·2	54·8	83·9	73·6	42·2	50·6	135·3	117·0	34·4	45·2	4·8
1896..	2·27	11	·70	0	63·3	57·4	85·1	75·2	41·1	54·0	135·9	119·7	32·3	48·0	5·6
1897..	1·87	11	·68	0	61·5	57·1	87·8	71·7	43·3	53·0	132·6	109·8	37·2	49·1	6·8
Mean ...	2·23	12	·70	0·3	59·8	55·2	83·1	71·3	41·8	50·9	129·5	113·2	36·8	47·0	5·6
Extremes	6·71	25	3·28	2	65·8	61·0	92·6	79·1	46·9	55·1	136·8	120·4	42·0	49·9	7·6
	·30	3	·20	0	55·4	52·2	71·9	64·7	35·6	46·9	120·6	106·9	31·0	43·4	3·5

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1899.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	56·2	21	28·1	25	47·7	37·5	38·7	88	71·2	22·4	2·52	20	6·0
Malta	65·5	29	43·2	7, 8	60·9	49·4	47·1	80	120·0	35·5	1·46	11	4·3
Cape of Good Hope	92·1	1	51·0	3, 9	76·8	58·7	56·7	69	...	...	·80	5	3·5
Mauritius	86·6	28	70·7	18	84·6	73·9	69·2	74	137·2	64·0	2·18	14	5·7
Calcutta	79·8	27	44·4	20	74·3	53·5	51·6	66	136·2	34·5	·21	1	1·8
Bombay	89·0	31	59·1	7	81·5	64·6	59·2	62	132·9	51·9	·00	0	0·4
Ceylon, Colombo	90·9	11	67·5	8	88·3	71·7	70·6	79	153·0	65·5	6·98	9	4·8
Melbourne	102·3	9	46·0	25	73·6	54·6	49·7	68	153·0	39·5	3·91	14	6·1
Adelaide	105·1	15	48·9	23*a*	77·3	56·8	48·8	54	163·0	37·5	1·00	10	4·9
Sydney	88·7	2, 3	54·2	31	79·2	64·0	59·8	64	146·7	46·1	2·06	12	3·4
Wellington	76·3	1, 28	50·0	11	69·9	57·4	52·8	68	141·0	44·0	4·84	15	4·5
Auckland	80·0	1, 30	54·0	10	73·0	59·8	56·5	71	144·0	49·0	3·64	11	5·0
Jamaica, Kingston	88·8	5	64·6	21	85·7	68·5	66·0	76	...	...	·78	8	4·4
Trinidad	89·0	9	61·0	21*c*	85·7	66·8	68·5	80	165·0	61·0	1·95	12	...
Grenada	82·0	14	69·4	6	79·8	71·0	65·9	70	147·8	...	9·10	24	3·4
Toronto	50·0	4	—6·9	11	29·7	15·1	20·6	79	58·0	—11·0	2·87	13	6·5
New Brunswick, Fredericton	47·8	5	—16·8	2	25·1	1·5	4·3	69	...	...	3·30	12	4·7
Manitoba, Winnipeg	34·5	11	—43·7	9	5·7	—15·3	...	...	...	...	1·77	6	4·5
British Columbia, Esquimalt	54·7	25	9·7	4	43·2	35·3	..	...	...	...	5·00	19	8·3

a—and 31. *b*—and 6. *c*—and 30.

REMARKS.

MALTA.—Adopted mean temp. 54°·4, or 1°·5 above average; mean hourly velocity of wind 9·3 miles, or 2·1 below average. Mean temp. of sea 60°·2. T88 on 4th and 13th; L on 12th, H on 4th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·2 above, of dew point 0°·7, and rainfall 4·87 in., below, their respective averages. Mean hourly velocity of wind 13·0 miles, or 1·8 above average; extremes, 33·3 on 8th, and 1·7 on 11th; prevailing direction E.S.E. and E. by S. L on 9th and 12th. T. F. CLAXTON.

Adelaide.—This was the coldest January ever experienced; the average max. (77°·3) being 9°·6 below the average of 42 years, and the mean temp. (67°·0) 7°·3 below average. C. TODD, F.R.S.

Sydney.—Temperature equal to average. Humidity 8, and rainfall 1·63 in., below their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part, with fresh N.W. winds; from 20th generally fine until 30th, when 1·22 in. of rain fell, with strong N.W. wind. T on 18th and 19th. Prevailing winds N.W. Mean temp. 1°·0, and rainfall ·93 in. above their respective averages. R. B. GORE.

Auckland.—Showery and unsettled through most of the month, the rainfall being an inch more than the average of 32 years. Mean temp. very slightly, barometric pressure much, below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Average hourly velocity of wind 2·1 miles. Rainfall one-half the average, Island rainfall one-eighth less than the average. Double shock of earthquake in the neighbourhood of Kingston on 21st at 9·35 a.m. Aurora borealis seen at Windsor Pen, on the north side of the Island, on 26th; the only previous record being in 1860. R. JOHNSTONE.

TRINIDAD.—Rainfall ·99 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·82	XI.	Builth, Abergwesyn Vic.	1·93
II.	Dorking, Abinger Hall .	1·36	,,	Rhayader, Nantgwillt ...	2·10
,,	Birchington, Thor	1·63	,,	Lake Vyrnwy	3·34
,,	Hailsham	·65	,,	Corwen, Rhug	2·55
,,	Ryde, Thornbrough	1·07	,,	Criccieth, Talarvor	2·26
,,	Emsworth, Redlands ...	1·06	,,	I. of Anglesey, Lligwy..	2·20
,,	Alton, Ashdell	2·03	,,	I. of Man, Douglas	...
III.	Oxford, Magdalen Coll..	·95	XII.	Stoneykirk, Ardwell Ho.	2·06
,,	Banbury, Bloxham	1·08	,,	New Galloway, Glenlee	3·39
,,	Northampton, Sedgebrook	1·12	,,	Moniaive, Maxwelton Ho.	2·76
,,	Stamford, Duddington..	1·17	,,	Lilliesleaf, Riddell	1·68
,,	Alconbury	1·02	XIII.	N. Esk Res. [Penicuick]	1·35
,,	Wisbech, Bank House...	1·60	XIV.	Glasgow, Queen's Park..	1·55
IV.	Southend	1·35	XV.	Inverary, Newtown	1·91
,,	Harlow, Sheering..... ...	·86	,,	Ballachulish, Ardsheal...	2·29
,,	Colchester, Lexden	1·43	,,	Islay, Gruinart School ...	1·06
,,	Rendlesham Hall	1·32	XVI.	Dollar.....	1·96
,,	Scole Rectory	1·10	,,	Balquhidder, Stronvar...	2·34
,,	Swaffham	·91	,,	Coupar Angus Station...	1·41
V.	Salisbury, Alderbury ...	2·33	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	1·86	XVII.	Keith H.R.S.....	2·04
,,	Blandford, Whatcombe .	1·42	,,	Forres H.R.S.	1·17
,,	Ashburton, Holne Vic...	2·48	XVIII.	Fearn, Lower Pitkerrie..	1·81
,,	Okehampton, Oaklands.	1·45	,,	S. Uist, Askernish	3·04
,,	Hartland Abbey	1·59	,,	Invergarry.....	1·20
,,	Lynton, Glenthorne ...	·67	,,	Aviemore H.R.S.	...
,,	Probus, Lamellyn	1·36	,,	Loch Ness, Drumnadrochit	1·56
,,	Wellington, The Avenue	·90	XIX.	Invershin	2·14
,,	North Cadbury Rectory	·99	,,	Durness	...
VI.	Clifton, Pembroke Road	1·54	,,	Watten H.R.S.....	1·09
,,	Ross, The Graig	2·04	XX.	Dunmanway, Coolkelure	2·03
,,	Wem, Clive Vicarage ...	2·14	,,	Cork, Wellesley Terrace	1·27
,,	Wolverhampton, Tettenhall	2·64	,,	Killarney, Woodlawn ..	1·42
,,	Cheadle, The Heath Ho.	2·12	,,	Caher, Duneske	2·13
,,	Coventry, Priory Row ..	1·57	,,	Ballingarry, Hazelfort...	1·96
VII.	Grantham, Stainby	1·51	,,	Limerick, Kilcornan ...	1·43
,,	Horncastle, Bucknall ...	1·71	,,	Miltown Malbay	2·58
,,	Worksop, Hodsck Priory	1·88	XXI.	Gorey, Courtown House	2·45
VIII.	Neston, Hinderton	2·47	,,	Moynalty, Westland ...	1·90
,,	Southport, Hesketh Park	1·56	,,	Athlone, Twyford	3·86
,,	Chatburn, Middlewood.	1·56	,,	Mullingar, Belvedere ...	3·05
,,	Duddon Val., Seathwaite Vic.	2·59	XXII.	Woodlawn	2·81
IX.	Melmerby, Baldersby ...	2·61	,,	Crossmolina, Enniscoe ..	3·74
,,	Scarborough, Observat'y	1·84	,,	Collooney, Markree Obs.	3·51
,,	Middleton, Mickleton ...	1·42	,,	Ballinamore, Lawderdale	2·03
X.	Haltwhistle, Unthank H.	1·06	XXIII.	Warrenpoint.....	2·25
,,	Bamburgh	1·57	,,	Seaforde.....	2·99
,,	Keswick, The Bank.....	·75	,,	Belfast, Springfield	2·16
XI.	Llanfrechfa Grange	2·01	,,	Bushmills, Dundarave..	2·25
,,	Llandovery	1·16	,,	Stewartstown	2·06
,,	Castle Malgwyn	1·30	,,	Killybegs	3·07
,,	Brecknock, The Barracks	1·77	,,	Horn Head	2·65

JUNE, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·49	— ·52	·92	30	6	87·1	5	42·3	15	0	0
II.		Tenterden	1·48	— ·37	·74	28	6	81·5	6	40·0	14	0	...
,,		Hartley Wintney	1·24	...	·55	28	6	84·0	3*a*	35·0	15	0	2
III.		Hitchin	...	...	...	...	...	...	...	...	...	...	...
,,		Winslow (Addington)	·96	— ·90	·39	19	6	82·0	4, 5	36·0	15	0	...
IV.		Bury St. Edmunds (Westley)	1·23	— ·56	·52	30	9	78·0	5	45·0	15	0	...
,,		Norwich (Brundall)	·89	...	·40	30	9	81·2	5	38·4	1	0	1
V.		Winterbourne Steepleton ...	1·99	...	·82	30	4	77·6	5	33·4	14	0	5
,,		Torquay (Cary Green)	1·17	...	·53	19	5	75·3	6, 7	45·7	15	0	...
,,		Polapit Tamar [Launceston]..	1·03	— 1·18	·35	30	8	79·3	6	37·1	3	0	0
VI.		Stroud (Upfield)	1·80	— ·59	·82	30	7	80·0	7	48·0	14	0	...
,,		ChurchStretton(Woolstaston)	2·32	— ·23	·74	28	10	76·0	6*b*	42·0	9	0	...
,,		Worcester (Diglis Lock)	1·18	— 1·25	·35	18	8	...	...	...	...	...	...
VII.		Boston	1·16	— ·73	·52	19	9	85·0	4*b*	40·0	15	0	...
,,		Hesley Hall [Tickhill].....	1·49	— ·43	·52	30	8	84·0	6	35·0	15	0	...
,,		Breadsall Priory	2·63	...	·89	18	8	79·0	5, 6	39·0	9*d*	0	5
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·36	— ·53	·40	19	10	...	...	...	...	...	...
,,		Skipton (Arncliffe)	1·81	— 1·55	·51	30	11	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·20	— ·55	·29	30	10	79·0	6	37·0	15	0	...
X.		Newcastle (Town Moor)	1·67	+ ·03	·46	29	8	...	..	...	...	...	...
,,		Borrowdale (Seathwaite).....	2·02	— 4·56	·38	20	12	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·41	— 1·02	·65	30	6	...	...	...	...	...	...
,,		Haverfordwest	2·01	— ·55	·74	20	5	81·2	6	38·9	4	0	1
,,		Aberystwith (Gogerddan) ...	2·71	...	·59	20	9	84·0	6	30·0	3	...	...
,,		Llandudno.....	2·52	+ ·75	·58	20	11	77·0	1	44·0	3	0	..
XII.	SCOTLAND.	Cargen [Dumfries]	2·94	+ ·99	1·18	28	9	81·6	16	38·6	3	0	...
XIII.		Edinburgh (Blacket Place)...	1·48	...	·43	28	8	79·6	12	44·4	3	0	...
XIV.		Colmonell	1·76	...	·51	28	11	79·0	17	35·0	2	0	...
XV.		Tighnabruaich	2·15	...	·68	27	8	74·0	16	42·0	2	0	...
,,		Mull (Quinish).....	3·23	— ·06	·63	27	18	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·90	+ ·15	1·10	29	7	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·70	+ ·20	·95	28	10	80·0	12	41·2	3	0	...
XVII.		Braemar	1·09	— ·90	·27	27	13	75·8	14	33·3	1	0	5
,,		Aberdeen (Cranford)	1·42	...	·40	20	11	75·0	15	34·0	13	0	...
,,		Cawdor (Budgate)	1·25	— ·15	·18	28	14	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	·92	— 1·57	·32	21	5	...	...	...	...	...	...
,,		Glencarron Lodge.....	2·22	...	·42	18	18	78·6	14	40·0	3	0	...
XIX.		Dunrobin	1·50	— ·52	·35	28	12	75·0	12	41·0	3	0	...
,,		S. Ronaldshay (Roeberry) ...	1·57	— ·19	·41	29	15	70·0	15	42·0	7	0	...
XX.	IRELAND.	Darrynane Abbey.....	2·03	...	·62	27	12	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·70	+ ·63	1·04	19	8	78·5	7	42·0	19*c*	0	...
,,		Broadford (Hurdlestown) ...	...	...	...	...	...	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·90	+ ·06	·63	20	8	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·64	— ·02	·90	20	8	74·4	11	45·9	19	0	0
XII.		Ballinasloe	2·82	+ ·52	·87	17	11	76·0	7*c*	44·0	19*f*	0	...
,,		Clifden (Kylemore)	4·03	...	1·05	27	11	...	...	...	...	...	...
XIII		Waringstown	2·69	+ ·62	·78	17	8	87·0	7	41·0	29	0	...
,,		Londonderry (Creggan Res.).	2·27	— ·15	·80	27	13	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·83	+ ·36	1·00	27	12	81·0	14	39·0	18	0	...

+ Shows that the fall was above the average ; — that it was below it.

a—and 4, 5. *b*—and 17. c—and 10, 11. d—and 15. e—and 30. *f*—and 20.

METEOROLOGICAL NOTES ON JUNE, 1899.

Abbreviations.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

London, Camden Square.—Absolute drought prevailed for 24 days from May 25th to June 17th, a period exceeded only five times in 41 years.

Tenterden.—A dry month with only a few showers until the great TSS of 28th and the wet night of 30th. The first week was hot, as was also part of the last week. Duration of sunshine 265 hours. On the 17th ended a period of 24 days absolute drought, and on 27th a period of 36 days of partial drought with ·35 in. of R.

Hartley Wintney.—The dry weather which began on May 26th did not break up until June 18th. The month was dry and bright, with plenty of sunshine. The average max. shade temp. for the first week (82°) was abnormally high. A terrific TS occurred on 28th, lasting from 5.15 to 7.45 p.m.; the storm passed off to S.E.; L damaged several trees and buildings. Ozone on 19 days. Many perfect summer evenings. L on 18th.

Winslow, Addington.—The dry weather which set in on May 25th was not broken until June 18th, there being 24 days without a drop of R. From 1st to 7th the day temp. was high, but it was cool at night. On the 28th there was a good deal of T, but not heavy, with little R. The ground was very dry at the end.

Bury St. Edmunds, Westley.—No R fell in the 24 days from May 25th to June 17th, but the effect on vegetation was not so injurious as might have been expected. Distant T on 24th, 28th and 29th.

Norwich, Brundall.—Exceedingly dry till the 18th, after which slight rains occurred. The country was much parched, and R was greatly wanted. Winds N. or N.E. from 6th to 17th. A great fall of temp. occurred at the close of the first week. Distant T on 29th.

Winterbourne Steepleton.—The early part of the month was hot and dry, the mean temp. of the week ending on 10th being 58°·4. With the exception of ·01 in. on May 28th, no R was registered between May 24th and June 18th. Distant T was heard on the afternoon of the 28th, with slight drizzle. A useful R fell steadily on 30th.

Torquay, Cary Green.—R 1·06 in. below the average. Mean temp. 60°·2, or 1°·3 above the average. Duration of sunshine 302 hours, being 65 hours 45 mins. above the average, and 62 per cent. of the possible amount; no sunless day. R of the first six months of the year 3·23 in. above the average.

Polapit Tamar [Launceston].—*Correction.*—Owing to the absence abroad of the regular observer, the results for March, April and May were sent from a new gauge, *not* for the old one which was in use during 1880–89, with which alone strict comparison can be made. The figures for the three months for the several columns in the monthly tables should have been :—

March	1·40	−1·13	·54	8	11	The temperature details were correct.
April	3·79	+1·57	·84	20	21	
May	3·38	+1·55	1·06	23	13	

Polapit Tamar [Launceston].—A dry month, particularly the first fortnight; the total R being considerably below the average. Distant T on 4th; loud T and vivid L on 6th.

Stroud, Uffield.—TSS on 20th, 28th and 30th.

Woolstaston.—The earlier part of the month was hot and dry, with cold winds at intervals, and no R fell till the 18th. A violent storm of T and L

raged from 5 to 6 p.m. on 28th, doing much damage. A labouring man working in the middle of a field in the neighbourhood was killed by L. Mean temp. 60°·6.

BREADSALL PRIORY.—Very dry and warm during the first half of the month. Very unsettled after the 18th.

ARNCLIFFE VICARAGE.—A very dry and hot month.

WALES.

HAVERFORDWEST.—Absolute drought prevailed for 22 days from May 26th to June 16th. From June 1st to 17th the sky was nearly cloudless, with very high temp., the max. exceeding 80° on 3 days, and the hay crop suffered from drought. From 17th to 21st R fell in large quantities, but from that date to the end it was fine and summer-like, with cloudy sky and without excess of temp. A sharp TS occurred at 2.30 a.m. on 28th, lasting for about half-an-hour.

GOGERDDAN.—Very bright sunshine every day for the first fortnight; the rest of the month very showery.

LLANDUDNO.—T and L on 20th, 28th and 30th.

SCOTLAND.

EDINBURGH, BLACKET PLACE.—Very warm and dry. Mean temp. 2°·5 above, and R 30 per cent. below, the normal. Distant T on the afternoon of 28th. Absolute drought for 25 days ended on 18th.

COLMONELL.—R 1·12 in. below, and mean temp. 2°·2 above, the average of 23 years. T and L on 20th; T on 27th and 28th.

TIGHNABRUAICH.—The beau ideal of a summer month.

ABERDEEN, CRANFORD.—The month was fine and warm, and the long continued drought told on the turnip crop; some land in this district has had to be sown three times.

S. RONALDSHAY, ROEBERRY.—A very good month upon the whole. Mean temp. 53°·0, or 1°·1 above the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—On the whole dry. The first part was very dry and hot, but on 17th it changed and became cold for several days. The last few days were showery but mild.

CARLOW, BROWNE'S HILL.—No R fell for 23 consecutive days from May 25th to June 16th. On 21st ·20 in. of R fell in ten minutes.

DUBLIN, FITZWILLIAM SQUARE.—A fine, warm and sunny month, rainless until the 17th, when an absolute drought of 23 days' duration was broken by a genial fall of R. At the close of the month the weather was broken, rainy and chilly, and a TS on 28th brought ·24 in. of R, but large falls occurred in the surrounding districts. Mean temp. 61°·3, or 3°·5 above the average. High winds on 2 days. Fog on 22nd. H on 28th. L on 17th. Solar halos on 3rd and 19th.

BALLINASLOE.—TSS occurred from 4 to 6 p.m. on 6th, and 6 p.m. to 10 p.m. on 21st.

OMAGH, EDENFEL.—Athough the drought which commenced on May 24th and ended on June 16th was prevented from being absolute by a drizzle yielding ·02 in. on June 2nd, there had not been before in 35 years (at least) a period of 24 days with only that amount of R; the nearest being 22 days' absolute drought in 1889. The remainder of the month, however, was so continuously and torrentially wet that the average R was considerably exceeded, and, as a result, abundant vegetation of all kinds covered the country at the close.

No. CCCCIII.] [PRICE FOURPENCE.
VOL. XXXIV. *Or 5s. per annum post free.*

PUBLIC LIBRARY

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
Definition of a Protracted Drought	97
Notes on the Thunderstorms on July 22nd-23rd	101
A Hot Morning in Cheltenham	102
Errata in *Met. Mag.*, 1898	102
Dryness at Parkstone, Dorset	103
The Moon in Relation to Air Temperature	104
REVIEW :—	
Quelques Recherches sur les centres d'action de l'Atmosphère	106
Results of Meteorological Observations at Camden Square during July for 40 Years, 1858–97	107
Climatological Table for the British Empire, February, 1899 ...	108
Supplementary Table of Rainfall, July, 1899	109
Rainfall and Temperature in July, 1899, at 50 Stations	110
Meteorological Notes on July, 1899	111

AUGUST, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

BRITISH RAINFALL.

Subscriptions of £1 or upwards received since the list in *British Rainfall*, 1898, was closed :—

	£	s.	d.
Barry Urban District Council	1	1	0
Arkwright, J. H., Esq.	1	1	0
Beck, Major W. Alcock	1	1	0
Newton, C. B., Esq., C.E.	1	1	0

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, on Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 10s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCIII.] AUGUST, 1899. [PRICE FOURPENCE, or 5s. per ann. post free.

DEFINITION OF A PROTRACTED DROUGHT.

THE dry period through which we are now passing has drawn attention to the above subject, and we have had more correspondence respecting it, than we have been able to deal with individually. The subject is therefore presumably one upon which some statement should be made.

Our first remark may seem rather uncourteous, but it is by no means so meant. Few persons have time to read up a subject thoroughly, and it is very much more easy to write a suggestive letter, than to weigh carefully what has been printed previously. We do not like reprinting what we have already written, but eight pages of *British Rainfall*, 1887, were devoted to considering "What is a Drought?" and yet not one of our correspondents refers to, or deals with, the difficulties pointed out in that paper.

The definitions of "Absolute" and of "Partial" Droughts have been accepted, there is therefore no need to refer to them.

Three others were mentioned, and of them the third was considered the best.

(1). *Long Droughts.* Periods of not less than 60 days with a total rainfall of less than 2·00 in."

This was rejected as being merely a modified form of the "Partial Drought," and partly also because of the tautology involved in speaking of "a long drought of 68 days."

(2) *Dry Periods.* This was an attempt to reduce to strict definition what is meant by a Hydraulic Engineer when he says that he must provide "for a drought of 160 or 180 days." He does not mean a rainless period of that duration, nothing of the kind ever occurred in this country, what then does he mean? We devoted about a page to pointing out the difficulties of deciding upon any satisfactory definition, and finally submitted

(3) "*Engineer's Drought.* A period of three or more consecutive months of which the rainfall is less than half the average."

On the following page we give the rainfall at Camden Square for 41 years, all those monthly totals which are less than half the mean fall for the month being printed in black type. It will be seen that this occurs about once in five months, but with extreme irregularity, *e.g.*, from October, 1865, to October, 1867, 25 months,

Total Rainfall at Camden Square, Middlesex, in each month of the Years 1858–99.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1858	·88	1·80	·69	2·90	2·76	·92	3·01	1·10	·85	1·58	·53	1·75	18·77
1859	·72	1·23	1·33	2·61	2·13	2·90	2·93	2·65	4·04	2·53	2·90	2·24	28·21
1860	1·97	1·25	1·87	1·45	3·57	5·47	2·26	4·48	2·92	1·77	2·72	2·51	32·24
1861	·43	1·93	2·43	1·30	1·39	2·13	2·42	·94	2·15	1·05	4·65	1·45	22·27
1862	1·92	·31	3·69	2·30	3·06	2·43	2·61	2·74	2·19	3·50	1·13	1·71	27·59
1863	2·80	·67	·85	·52	1·27	4·86	·92	1·44	3·49	1·62	1·84	1·31	21·59
1864	1·02	·85	2·62	·82	1·86	1·28	·62	1·33	2·55	1·13	2·49	·36	16·93
1865	3·90	2·01	1·12	·33	3·40	2·21	2·33	4·10	·55	6·22	1·96	1·35	29·48
1866	3·90	3·72	1·69	1·76	2·03	3·98	1·19	2·76	3·89	2·32	1·73	2·63	31·60
1867	2·81	1·44	2·48	2·36	2·45	1·22	4·30	2·63	2·23	1·92	·86	1·59	26·29
1868	3·89	1·21	1·28	1·50	1·58	·78	·45	2·28	1·74	2·54	1·03	5·12	23·40
1869	2·76	2·48	1·97	1·28	3·27	1·03	·62	1·26	3·56	1·87	2·38	2·94	25·42
1870	1·38	1·21	2·31	·47	·70	·83	1·22	2·69	2·00	3·68	1·76	3·07	21·32
1871	1·99	1·27	1·19	2·84	·92	3·49	4·12	·85	5·28	1·34	·60	1·13	25·02
1872	3·46	·96	2·66	1·39	3·05	2·55	2·57	2·05	1·64	5·20	3·98	4·35	33·86
1873	2·44	1·96	1·46	·55	1·56	2·24	1·81	2·87	2·46	2·97	1·87	·48	22·67
1874	1·18	·91	·39	1·26	1·14	2·05	·82	1·32	2·62	3·34	2·21	1·58	18·82
1875	3·22	1·06	·69	1·53	1·61	2·40	4·63	1·79	2·86	4·35	3·36	·94	28·44
1876	·94	1·97	2·96	1·90	·94	1·27	·81	1·79	2·86	1·40	3·07	6·25	26·16
1877	4·74	1·78	2·38	2·59	1·91	·42	3·94	2·23	·82	1·97	3·88	1·51	28·17
1878	1·31	1·49	1·12	4·97	3·89	6·71	·64	6·72	·83	1·99	2·95	1·46	34·08
1879	2·87	3·77	·91	2·72	3·46	4·76	4·17	5·11	3·67	·80	·72	·86	33·82
1880	·31	2·33	·79	2·15	·26	4·04	5·11	·45	4·04	5·78	1·85	3·17	30·28
1881	1·85	3·09	2·30	·46	1·52	1·72	1·85	4·89	2·03	2·99	2·75	2·47	27·92
1882	1·30	1·30	1·35	2·83	1·20	2·30	2·95	1·48	2·39	4·96	2·57	2·51	27·14
1883	2·08	3·62	·86	1·56	1·97	1·35	2·92	·93	3·83	1·75	2·78	·75	24·40
1884	2·30	1·40	1·41	1·02	·78	2·84	2·46	·89	1·77	·99	1·92	2·57	20·35
1885	1·43	2·86	1·65	2·32	2·63	1·99	·52	·85	4·30	3·73	3·31	1·05	26·64
1886	4·02	·63	1·38	1·22	4·79	·63	2·37	·76	1·73	2·43	2·71	4·34	27·01
1887	1·26	·48	1·65	1·41	1·45	·91	1·07	3·15	1·81	1·24	3·40	1·38	19·21
1888	·90	·78	3·34	2·37	1·18	2·31	4·91	3·61	1·43	1·23	4·38	1·29	27·73
1889	·81	2·28	1·36	2·06	3·22	2·03	2·64	1·80	1·77	3·75	·89	1·23	23·84
1890	2·46	1·04	1·76	2·02	1·25	2·82	4·19	1·55	·64	1·20	1·62	·68	21·23
1891	1·80	·01	2·01	1·13	2·72	·86	3·82	4·75	1·03	4·80	1·98	3·24	28·15
1892	·50	1·62	1·04	·99	1·51	2·46	1·62	3·06	2·12	3·78	2·53	1·37	22·60
1893	1·44	2·87	·32	·24	·80	·73	2·46	1·61	1·07	3·87	2·16	2·23	19·80
1894	2·87	1·74	1·18	1·74	1·85	1·84	3·25	2·85	1·04	4·45	2·85	2·28	27·94
1895	1·96	·12	1·42	1·34	·34	·30	3·42	3·09	1·28	2·84	3·17	2·19	21·47
1896	·78	·29	3·20	·55	·14	2·27	1·03	1·92	5·51	3·05	1·17	3·61	23·52
1897	2·05	2·75	3·42	1·57	1·08	1·87	·64	2·92	2·75	·56	1·05	2·20	22·86
1898	·73	1·08	1·46	1·01	2·26	1·11	1·09	1·18	·33	2·96	1·94	2·54	17·69
1899	2·52	2·00	·50	2·64	1·38	1·49	1·45	...	...	...	...	...	...
Mean, 1858-97	2·02	1·61	1·71	1·66	1·92	2·23	2·39	2·39	2·39	2·71	2·30	2·13	25·46

there was no such month, and from May, 1881, to July, 1883, there were 27 consecutive months without such a month; on the contrary during the 36 months ending with December, 1898, instead of the average of 7, there were 13.

The yearly numbers have been—

1858...	6	1868...	3	1878...	2	1888...	3	1898...	5
9...	1	9...	2	9...	3	9...	2	9...	1
1860...	0	1870...	3	1880...	4	1890...	3		
1...	3	1...	4	1...	1	1...	3		
2...	2	2...	0	2...	0	2...	1		
3...	4	3...	2	3...	2	3...	5		
4...	4	4...	2	4...	3	4...	1		
5...	2	5...	2	5...	3	5...	3		
6...	1	6...	3	6...	3	6...	5		
7...	1	7...	2	7...	4	7...	3		
Total.	24		23		25		29		

The distribution of these less-than-half-the-average-months throughout the year is very equable, the only inequality being that (as the result of TS rains) they are rather more frequent than usual in June and July.

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
10	8	7	8	8	11	13	9	9	9	8	7

We have examined the table for instances fulfilling the definition (3) quoted above, and have obtained the following "Engineer's Droughts"—

PERIOD.	Duration in Months.	Total Rain.	Half-Mean Rain.
		in.	in.
1858. Aug.—Nov.	4	4·06	4·90
1863. Feb.—May	4	3·31	3·45
1868. May—July	3	2·81	3·27
1869. June—Aug.	3	2·91	3·51
1870. Apr.—July	4	3·22	4·10
1871. Oct.—Dec.	3	3·07	3·57
1873-4. Dec.—Mar. ...	4	2·96	3·73
1879-80. Oct.—Mar....	6	5·81	6·24
1884. Aug.—Oct.	3	3·65	3·75
1885. June—Aug.	3	3·36	3·51
1890-1. Sept.—Feb. ...	6	5·95	6·58
1893. Mar.—July	5	4·55	4·95
1895. Jan.—June	6	5·48	5·58
1896. Apr.—July	4	3·99	4·10
1897-8. Oct.—Jan. ...	4	4·54	4·58
1898. June—Sept.	4	3·71	4·70

In computing the above we have come upon a fact which we do not like, and which seems to show that this definition will not do *as it stands*. We had better illustrate this by an actual case—

200855 FILED

1893.	Total Rain.	Mean. / 2	Deficiency Monthly.	Cumulative.
	in.	in.	in.	in.
March	·32	·85	— ·53	— ·53
April	·24	·83	— ·59	— 1·12
May	·80	·96	— ·16	— 1·28
June	·73	1·12	— ·39	— 1·67
July	2·46	1·19	+ 1·27	— ·40
	4·55	4·95		

The drought had evidently ceased after June, but the total of the *five* months is less than half the mean for the five months, and therefore a month is included which apparently would be better out, though after such a dry period it is doubtful whether the excess of 1·27 in. would be of use.

This evil might be cured by specifying that *all* the months must have less than half the mean; but this would give only two droughts of 4 months in 41 years, in 1893 and in 1898, and three others of 3 months, viz., in 1863, 1870, and 1879.

Another objection to this definition is that until you have accumulated at least twenty or thirty years observations, you cannot tell precisely what your monthly mean is, and therefore cannot tell whether you have a drought or not.

But on the other hand if the definition specifies any fraction of an inch per week or month, droughts would never be recorded in wet districts, or else would occur every month or two in dry ones.

That is one objection to the suggestion made by the Rev. H. A. Boys in the interesting letter which we append. There are two others—(1) Individual observers can easily work up a drought at one station, but if they are to be worked out at headquarters (and we should certainly not print them without checking) it will imply that we must have another assistant—there must be some limit to the work thrown upon us. (2) The effect of droughts is so very different according to the season at which it occurs that it would be much better if this could be recognised.

We agree with Mr. Boys that the subject "bristles with difficulties."

WANTED—A DEFINITION OF A PROTRACTED DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—During the 156 days from February 16th to July 21st inclusive, *i.e.*, for more than 5 months, the rainfall here was only 5·77 in. in all, or not quite ·037 in. per diem.

During the 87 days from April 26th to July 21st inclusive, that is, during the time when rain is most wanted in at least fair quantity, I measured only 2·57 in., or just over ·029 in. per diem.

The state of my garden, my pond, and my well, impels me to ask whether we do not need a definition of a "Protracted Drought?"

For all practical purposes a protracted drought concerns us much more than an "absolute" and a "partial" drought which just come within their respective definitions. This July has seen a far more injurious drought than June or March, though it can chronicle neither "absolute" nor "partial" drought by the definition.

I am well aware of the difficulty of framing a satisfactory definition of a protracted drought, for regard should be had to the season of the year—the spring and early summer months being those when a long drought is most serious—and to the average rainfall of the station concerned; but I offer the following as a fairly suitable basis for a definition where the average annual rainfall is not above 35 ins.

Let a protracted drought be claimed for—

60	days, or	2	months,	with	not	more	than	·02 in. per diem.
90	,,	,, 3	,,	,,	,,	,,	·03	,,
120	,,	,, 4	,,	,,	,,	,,	·04	,,

and intermediate numbers of days in proportion.

The allowance per diem must clearly be on a sliding scale; and the above scale can hardly be called too lax, seeing that it would allow me only 2·52 in. for my 87 days of drought. The subject bristles with difficulties, but they should not be beyond solution.

Yours truly,

H. A. BOYS.

North Cadbury Rectory, Somerset, August 1st, 1899.

NOTES ON THE THUNDERSTORMS OF JULY 22ND–23RD.

CITY ROAD, LONDON, E.C.—TS in early hours of 23rd; R ·97 in. *J. Bigwood.*

TENTERDEN.—TS 10 p.m., 22nd, till 1 a.m. on 23rd; R ·81 in. *J. E. Mace.*

RIVERHEAD VICARAGE, SEVENOAKS.—Heavy R 10.30 to 11.45 a.m. on 23rd, probably 1·30 in.; the total for the day was 1·48 in. *J. Burn Murdoch.*

REDLANDS, EMSWORTH.—TS passed from S.W. to N.W. between 1.50 and 4.10 p.m., 23rd, yielding 1·58 in. of R. *F. Jacomb Hood.*

BROOMFIELD HALL, CHELMSFORD.—Very heavy TS from 5.30 to 7.0 a.m., R about 2·00 in., the total up to 9 a.m., 23rd, 2·78 in. *W. Impey.*

BEECH HOLME, BOCKING, BRAINTREE.—TS from 2.30 to 9.0 a.m., 23rd, with 2·24 in. of R. During the previous ten years the greatest fall on one day had been 1·87 in. on July 26th, 1894. *T. Taylor.*

SUDBURY.—Heavy R from 3 to 8 a.m., total ·88 in., and in the 24 hours (mostly before 6 p.m., 23rd) the total was 2·31 in. *J. Alexander.*

GELDESTON, BECCLES.—R for 23rd 0·78 in., and for 24th 1·26 in. *E. T. Dowson.*

STEEPLETON MANOR, DORCHESTER.—TS and heavy R, 6 to 9 a.m., 23rd; total (entered to the 22nd), 1·39 in. *H. Stilwell.*

SOUTHTOWN HOUSE, KENTON, EXETER.—The R on the night of July 22nd–23rd was unprecedented during the 21 years I have lived here. A TS began at 7.45 p.m. on 22nd, with jagged H. Although no drains were choked, they were insufficient to carry the water, which consequently flowed through the house. Several chickens were drowned in their coops. In less than an hour 1·10 in. of R fell, and during the rest of the night there was a further fall of ·11 in., making the total 1·21 in. *G. H. Courtenay.*

A HOT MORNING IN CHELTENHAM.

To the Editor of the Meteorological Magazine.

SIR,—The abnormal heat at 9 a.m. on 20th July, 79°·7, has never been surpassed here during the past twenty-two years, and was reached once only on June 26th, 1878. On August 18th, 1893, it was 79°·2, and on July 20th, 1878, it was 78°·7. These are the only dates on which the shade temperature at 9 a.m. during the above period was within at least two degrees so high.

The maximum temperature was by no means so high as would be expected, as it reached only 86°·0.

Faithfully yours,

RICHARD TYRER, B.A.

The Observatory, Cheltenham, July 22nd, 1899.

ERRATA IN METEOROLOGICAL MAGAZINE, 1898.

REGULAR TABLE.

Glencarron	July ...	Total rain *should be* 6·66 in.	*not*	5·66 in.
Wetherby, Ribston ...	February...	,, ,, ,, 1·09 ,,	,,	1·04 ,,
Carlow, Browne's Hill	Nov.	Diff. from average ,, +1·35 ,,	,,	—1·35 ,,

SUPPLEMENTARY TABLE.

Ballinamore, Lawderdale...	Jan....	Total rain *should be* 2·61 in.	*not*	6·55 in.
North Cadbury Rectory ...	April..	,, ,, ,, 2·01 ,,	,,	1·85 ,,
New Galloway, Glenlee ...	Nov....	,, ,, ,, 6·66 ,,	,,	6·96 ,,

DRYNESS AT PARKSTONE, DORSET.

To the Editor of the Meteorological Magazine.

SIR,—Perhaps the enclosed record of another very dry day (July 30th) may be of sufficient interest for a place in the Monthly Magazine :—

Year. Month, Day.	Time.	Dry Bulb.	Wet Bulb.	Dew point.	R. H.	
1886. July 4	2. 5 p.	85·2	63·1	48·7	28	The R. H. was 34 and below from noon to 6 p.
	3. 5 p.	85·6	63·3	48·8	28	
1887. July 4	3. 5 p.	83·6	62·5	48·5	30	The R. H. was 35 and below from noon to 4 p.
1892. April 2	3. 0 p.	69·7	49·9	34·6	27	The R. H. was 30 and below from 2.30 p. to 5.30 p.
	3.15 p.	69·5	49·3	33·6	27	
April 3	2. 0 p.	67·9	49·5	35·0	29	The R. H. was 36 and below from noon to 4 p.
	3. 0 p.	67·7	49·1	34·4	29	
1893. May 11	3. 0 p.	71·9	52·7	38·2	29	The R. H. was 31 and below from 3 to 5 p., and 40 and below from 9.15 a. to 6 p.
June 16	1. 0 p.	85·1	64·1	50·3	30	The R. H. was 35 and below from 0.15 p. to 3 p.
1899. July 30	1.20 p.	84·2	64·3	51·2	32	The R. H. was 40 at noon, and 39 at 6 p.
	2. 0 p.	86·7	66·1	52·8	31	
	2.30 p.	85·0	64·5	51·0	31	
	3. 0 p.	87·0	65·5	51·6	30	
	3.15 p.	86·8	65·1	51·2	29	
	3.30 p.	86·7	65·9	52·5	31	
	3.45 p.	86·5	66·2	53·1	32	

With a max. temp. of 87°·6, July 30th was the hottest day since June 19th, 1893, when the max. was 87°·9, and the driest day since June 16th of same year. I give all the days on which the R.H. was 30 and under since April, 1882, when I began observations, and some of which I believe you have had before in detail. It will be seen that the greatest difference between dry and wet was 22°·3 on July 4th, 1886, but the lowest R.H. was 27, with a difference of 20°·2 on April 2nd, 1892, the temperature being 16° lower.

I remain, yours very truly,

R. H. BARNES.

P.S.—July rainfall here *0·51* in.

Heatherlands House, Parkstone, Dorset, August 1st, 1899.

THE MOON IN RELATION TO AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—Those who read my letter, "On a recent recurrence in weather," and Mr. Helm Clayton's a little later, may have found it difficult, I think, to account for the vigour, not to say vehemence, of Prof. Hazen's onslaught! For myself, I distinctly said that "I do not affirm lunar influence in the case;" pointed out that the recurrence noticed in those eight months was not met with some time, at least, previous; and hinted that it might disappear in future (which it has apparently done). This "extremely wild" letter merely suggested a matter that seemed worth investigating. The striking relations brought out by Mr. Helm Clayton, and, I may add, the researches of Herr Barthe in Germany,* further show the interest of the subject.

It seems to me that there are some weak points in Prof. Hazen's argument. He sets out with a remarkable "established fact," got by "*a priori* reasoning," viz., that "the moon can have no effect on temperature." Are we really in possession of such a fact, so gained? Then we may at once close our book of records. For not only is this recurrence in eight months inadequate to prove lunar influence (it is admittedly so in any case), but any amount of such recurrence, with the utmost regularity, if we found such, would obviously have no weight whatever. We have a true doctrine about the moon which cannot be disturbed.

One is prompted, however, to ask, Is this science? Does it not rather savour of obscurantism? If we grant (as we may) that the moon gives too little heat to materially affect air temperature, are there not other ways in which she might do so? The chain of causation in nature is sometimes "far to seek," as where Huxley connected the fertilisation of red clover with the number of old maids in the country (through bees, field-mice and cats). But here we need not, I think, be greatly at a loss, if explanation were required; for, a connection of the moon with temperature through barometric pressure is surely not very unthinkable. Not only is it *a priori* very probable that the moon influences air-pressure, but we have some good evidence of such action (through the researches of Garrigou Lagrange, Poincaré and others). Prof. Hazen says that "changes of temperature are due entirely to the progress of high and low pressure areas, &c." These are, no doubt, proximate causes, but what of more remote ones? Do we know enough about these things to be able to say that the moon has nothing to do with the course of such areas? No thoughtful meteorologist, I feel sure, will say so. And even if the conditions of that progress were clearly understood, might not the moon be concerned in the "several other conditions, not clearly

* *Das Wetter*, March. Taking the lunations of 1896–98, he finds, on an average, a maximum of temperature shortly before new moon, and a minimum shortly before full moon.

understood?" In short, it seems important to keep an open mind in view of the countless possibilities in Nature.

The figures given by Prof. Hazen I cannot regard as necessarily fatal to the view in question, considering the possibility of a meteorological influence being at one time apparent, at another masked. If this be a sound principle (as I believe it is, though it must be applied with care and judgment), then the mere "massing of statistics" (those of times of "apparent" and "masked" influence alike) may lead to obscuration rather than to the eliciting of truth.

I am not prepared, however, to say that this principle applies with satisfactory results in the present case; and, what little further study I have given to the matter has not, thus far, I think, yielded such evidence as to put the lunar relation beyond doubt.

The following notes may, perhaps, save some labour of inquiry on the part of others. The total length of the "recent recurrence" appears to be *ten* lunations (June, 1898, to March, 1899). Having gone through the lunations since 1880, I am able to say something about the frequency of those long spells. Each case with the new-moon week (relatively to the average) *warmer* than the full-moon week before, is represented by a *plus* quantity (call them A cases); and each with new-moon week *cooler*, by a *minus* (B cases). In 1894 came a long spell of 8 A cases (February to September), and in 1896–97 two spells of 6 A cases each, divided by one B case (February, 1896—February, 1897). These are the only spells of this class coming up to *six* lunations. It is a curious fact that while A cases preponderate in the nineties (64 against 46), B cases preponderate in the eighties (70 against 53). A cumulative curve, got through algebraic addition, step by step, of the successive items, goes steadily down (on the whole) in the eighties, but mounts in the nineties, at least from about 1892 (pointing, perhaps, to some slow secular change?) In the eighties the longest spells are those of B cases, and they do not exceed six lunations. There are three groups of six—one in March to October, 1882; another, December, 1883, to May, 1884; the third, July to December, 1887. These facts may be left for the consideration of your readers; and I would merely note the practical, as well as theoretical, interest of these long spells in our weather.

With regard to another point in Prof. Hazen's letter, I would invite attention to the section on "lunar periods" in M. Angot's excellent "*Traité élémentaire de Météorologie*" (1899). As to lunar influence on weather, he considers that we cannot at present affirm it; but also we cannot deny its possible existence. "En tous cas," he remarks (p. 400), "elle se manifesterait par des phénomènes complexes, tels que le déplacement des zones de hautes et de basses pressions, et pourrait ainsi se traduire par des résultats immédiats très différents d' une région à l'autre" (a view which seems more philosophical than that of our present critic).—Yours faithfully,

ALEX. B. MACDOWALL.

REVIEW.

Quelques Recherches sur les centres d'action de l'Atmosphère. II. La Pluie par H. Hildebrand Hildebrandsson. K. Svenska Vetenskaps-Akad. Hand. Band 32 No. 4. 4to., Stockholm, 1899, 22 pages, 4 plates.

On receiving this paper we glanced rapidly through it, noticing chiefly the lines printed in Italics—for instance on page 5, "The diagram shows that the depth of rain during the cold season of different years is almost always opposite" at each of certain pairs of stations.

On page 6, "Now the rainfall of Siberia from October to March is generally inverse to that which falls during the subsequent wet season in India."

Lastly, on page 9, "During 15 consecutive seasons there exists a satisfactory concordance between the winter rainfall of British Columbia and that of the following autumn at the Azores."

Needless to say that we resolved upon reading the whole memoir, and examining the curves—for there are few things more tempting to the meteorologist than the chance of knowing what is to happen six months hence. We may say at once that with regard to the third of the above extracts the figures and diagram show an agreement between the records at British Columbia and at the Azores to which no word is so appropriate as "marvellous," but the demonstration would be immensely strengthened if a chain of stations on the line joining these widely separated localities showed analogous or even opposite features. We admit the similarity of the curves, and we hope that they prove interdependence and relation, but we should like confirmatory evidence.

The three curves which form Diagram No. 29 fit very well and quite justify Dr. Hildebrandsson's remarks "With only one or two exceptions they show that the winter rains at Thorshaven have the same character as the *previous* summer at St. John's, Newfoundland and as the *following* summer at Berlin."

There can be no question as to the interest, or the importance, of the research upon which Dr. Hildebrandsson has entered, everybody will wish him success. We notice his complaint respecting the difficulty of obtaining in Continental cities the publications of British Colonies, and his offer to exchange publications. Until statesmen learn a little meteorology, we have no hope that Directors will be allowed a free hand in the distribution of their reports; but our opinion is that (1) the number of copies authorised is too small, (2) that the Directors are so short-handed that they have to do clerical work of which they ought to be relieved, so as to give them more time to keep in touch, and in correspondence, with workers in the Northern Hemisphere. It is not economy to make a man do so much routine that he has not time to think.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

JULY.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	3·01	10	·77	0	61·2	56·4	87·4	73·3	44·7	51·9	..	..	..	..	5·6
1859..	2·93	8	·96	0	68·0	62·9	91·9	81·2	47·5	58·4	..	..	..	..	4·4
1860..	2·26	12	·76	0	58·7	55·3	75·9	69·9	41·4	51·2	..	..	38·1	48·5	6·6
1861..	2·42	18	·40	0	61·5	57·2	76·8	71·9	48·2	53·8	..	..	40·8	48·8	5·7
1862..	2·61	15	·59	0	59·6	55·4	80·2	70·3	43·3	50·7	..	..	38·8	47·3	6·1
1863..	·92	3	·49	0	61·2	56·7	85·0	74·2	40·3	50·2	..	..	32·8	45·4	4·1
1864..	·62	6	·18	0	62·5	58·9	86·6	76·2	45·5	51·9	..	..	38·5	48·6	6·2
1865..	2·33	15	·87	0	64·2	59·8	85·3	77·6	46·8	55·4	..	..	43·6	51·0	4·7
1866..	1·19	11	·24	0	61·4	57·5	87·2	72·9	46·8	53·3	..	..	36·3	45·9	5·3
1867..	4·30	14	1·82	1	60·5	55·9	76·9	70·9	44·0	52·0	..	..	38·7	48·6	5·4
1868..	·45	3	·22	0	68·1	61·1	93·3	82·4	48·0	56·5	..	..	45·2	53·8	4·1
1869..	·62	5	·38	0	64·5	60·0	91·0	77·8	47·5	54·8	..	..	43·8	51·8	5·1
1870..	1·22	11	·31	0	65·7	59·6	90·8	78·3	44·6	56·6	136·8	119·6	41·9	53·1	5·5
1871..	4·12	18	1·23	1	61·5	57·2	82·2	72·6	45·8	54·4	131·0	117·1	45·2	53·5	6·2
1872..	2·57	13	·89	0	65·5	60·6	92·3	78·5	47·2	56·6	132·9	123·2	45·2	54·6	5·4
1873..	1·81	12	·97	0	63·7	58·5	90·1	76·1	45·8	54·1	135·2	123·1	43·1	51·4	5·5
1874..	·82	11	·22	0	64·6	59·8	90·8	78·4	47·3	54·6	134·0	123·4	42·6	52·4	4·3
1875..	4·63	17	1·29	1	59·6	56·3	80·4	69·8	42·5	52·2	129·0	107·7	36·6	49·8	5·8
1876..	·81	7	·27	0	65·9	60·2	92·6	78·7	47·3	56·7	134·2	121·9	40·8	53·5	4·9
1877..	3·94	14	·70	0	62·1	57·6	87·1	71·9	43·6	53·0	133·9	115·6	32·0	49·5	6·0
1878..	·64	7	·28	0	63·7	59·3	86·2	75·1	43·5	55·2	135·2	121·6	41·1	52·5	5·4
1879..	4·17	20	·91	0	58·3	55·5	80·2	67·7	45·6	52·1	130·3	107·7	41·6	49·7	7·9
1880..	5·10	23	·85	0	61·6	57·6	79·2	72·5	47·5	54·5	132·0	118·8	45·0	51·7	6·5
1881..	1·85	14	·55	0	65·5	59·1	94·6	77·9	44·3	55·8	137·7	119·8	38·3	52·0	4·9
1882..	2·95	18	·95	0	60·4	56·2	77·8	71·5	46·0	53·0	128·8	116·4	44·1	50·3	6·1
1883..	2·92	14	1·43	1	60·0	55·5	84·7	70·5	42·1	52·1	127·6	112·9	38·6	48·1	6·3
1884..	2·46	17	·60	0	63·2	59·1	86·9	74·1	42·2	54·4	125·0	111·8	35·7	50·0	6·3
1885..	·52	6	·25	0	63·3	57·6	90·4	76·6	47·6	54·7	129·3	117·0	40·5	49·6	5·3
1886..	2·37	11	·66	0	63·0	57·8	87·5	74·4	44·4	54·4	133·4	117·0	40·0	50·0	5·5
1887..	1·07	9	·29	0	66·0	59·8	88·8	78·9	45·6	55·6	133·4	123·1	43·8	51·9	4·0
1888..	4·91	26	·90	0	58·1	55·3	72·7	67·1	42·8	52·3	120·2	105·9	41·6	50·3	7·6
1889..	2·64	17	·86	0	61·0	56·6	80·9	71·0	46·1	54·0	126·3	111·7	41·4	50·7	6·8
1890..	4·19	14	1·67	1	59·9	55·6	76·2	69·3	42·4	52·6	126·9	111·5	40·6	51·0	6·3
1891..	3·82	17	·76	0	60·4	56·2	84·3	70·6	44·6	52·8	127·1	113·4	40·3	48·6	5·8
1892..	1·62	9	·68	0	59·9	55·3	81·7	70·5	46·3	52·2	129·0	113·4	41·6	48·1	6·5
1893..	2·46	17	·46	0	62·9	57·7	90·7	74·5	47·3	55·2	130·3	115·6	43·0	51·8	5·9
1894..	3·25	17	1·12	1	62·2	58·0	88·2	73·0	48·9	54·8	128·2	114·1	42·6	50·9	6·8
1895..	3·42	12	·57	0	62·0	56·5	82·0	72·7	47·7	54·6	125·2	114·1	43·1	50·7	6·0
1896..	1·03	7	·49	0	64·6	58·3	88·7	77·5	47·7	55·2	133·0	119·3	41·1	49·4	5·7
1897..	·64	8	·38	0	64·1	58·3	83·6	75·8	44·0	55·3	130·1	117·8	36·1	49·9	4·0
Mean ...	2·39	13	·71	0·2	62·5	57·8	85·2	74·1	45·4	54·0	130·6	116·2	40·6	50·4	5·7
Extremes	5·10	26	1·82	1	68·1	62·9	94·6	82·4	48·9	58·4	137·7	123·4	45·2	54·6	7·9
	·45	3	·18	0	58·1	55·3	72·7	67·1	40·3	50·2	120·2	105·9	32·0	45·4	4·0

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1899.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		TotalRain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	64·8	10	24·9	27	48·6	35·8	36·4	82	95·6	22·1	2·00	11	5·2
Malta	66·1	1	44·0	6	61·5	50·6	49·4	85	129·6	40·0	1·52	9	3·3
Cape of Good Hope	94·6	23	49·7	7	78·9	59·5	57·0	73	...	...	·22	1	2·6
Mauritius	87·4	9	69·1	6	84·3	74·1	71·5	81	162·3	63·4	7·24	20	6·6
Calcutta	87·6	26	50·4	2	82·5	60·8	57·6	63	144·0	40·5	·06	2	2·0
Bombay	88·4	3	65·9	19	82·8	69·0	64·9	69	136·0	56·4	·00	0	1·2
Ceylon, Colombo	93·7	28	68·5	5	89·2	71·9	70·0	76	153·0	65·6	2·78	4	0·8
Melbourne	101·8	14	48·2	2	82·4	58·3	53·5	57	153·8	41·9	1·44	2	3·4
Adelaide	113·6	12	50·0	28	91·5	65·5	52·0	41	167·8	44·8	1·50	7	3·1
Sydney	83·1	27	56·6	1	76·4	64·6	64·8	67	146·9	52·0	1·04	13	5·4
Wellington	73·0	16	44·0	10	66·9	53·7	49·6	68	135·0	36·0	8·42	7	4·1
Auckland	84·5	17	50·0	9	74·4	59·1	55·0	67	141·0	43·0	1·86	7	3·8
Jamaica, Kingston	88·6	24	63·9	24	85·9	67·8	64·8	74	...	...	·49	4	3·2
Trinidad	89·0	1	63·0	4	86·1	67·3	67·9	76	161·0	60·0	1·82	11	...
Grenada	84·0	7	67·8	16	80·1	70·6	68·7	76	150·4	...	7·16	20	2·0
Toronto	46·2	26	−12·6	11	25·5	11·9	18·0	80	66·2	−16·5	1·73	11	5·7
New Brunswick, Fredericton	43·9	18	16·3	8	24·1	4·0	4·7	66	...	...	3·63	11	4·9
Manitoba, Winnipeg	35·8	20	−16·5	8	3·7	−17·4	...	...	...	...	·84	7	4·5
British Columbia, Esquimalt	52·9	19	12·1	4	41·8	33·7	..	...	...	...	5·36	20	7·9

REMARKS.

MALTA.—Adopted mean temp. 55°·2, or 1°·3 above average. Mean hourly velocity of wind 10·3 miles, or 1·6 miles below average. Mean temp. of sea 61°·2. L on 22nd and 23rd. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3 below, of dew point 1°·4 above, and rainfall ·38 in. above, their respective averages. Mean hourly velocity of wind 9·7 miles, or 1·7 below average; extremes, 24·8 on 1st, and 2·6 on 5th and 18th; prevailing direction E. by N. and variable. L and T on 4th, 9th and 21st, and T on 10th, 18th to 20th and 28th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 79°·6, or 0°·5 below, of dew point 0°·3 below, and rainfall ·38 in. above, average. Mean hourly velocity of wind 7·1 miles; prevailing directions, N.E., S.W. and W. T88 on 3 days. H. O. BARNARD.

Adelaide.—A very hot and dry month, the mean max. temp. being 5°·5 above the average of 42 years. C. TODD, F.R.S.

Sydney.—Mean temp. 0°·5 below, humidity 9·9 below, and rainfall 4·21 in. below, average. Weather still very dry over all western districts. H. C. RUSSELL, F.R.S.

Wellington.—Very wet during the early part of the month, especially between 5th and 9th, the max. fall being 3·53 in. on 6th, which caused heavy floods. The remainder of the month was fine. Prevailing N.W. and S.E. winds, generally moderate. H on 8th. Temp. 2°·2 below, and rain 4·88 in. above, their respective averages. R. B. GORE.

Auckland.—A fine warm and dry month. Mean temp. slightly below the average; rainfall little more than half the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Rainfall two-thirds of the average. Mean hourly velocity of wind 3·2 miles. Island rainfall one-third over the average. R. JOHNSTONE.

TRINIDAD.—Rainfall ·13 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·79	XI.	Builth, Abergwesyn Vic.	3·22
II.	Dorking, Abinger Hall .	·93	,,	Rhayader, Nantgwillt ...	2·65
,,	Birchington, Thor	1·42	,,	Lake Vyrnwy	2·04
,,	Hailsham	1·41	,,	Corwen, Rhug	3·82
,,	Ryde, Thornbrough	·40	,,	Criccieth, Talarvor	2·59
,,	Emsworth, Redlands ...	2·26	,,	I. of Anglesey, Lligwy..	3·78
,,	Alton, Ashdell	·94	,,	I. of Man, Douglas	4·04
III.	Oxford, Magdalen Coll..	1·18	XII.	Stoneykirk, Ardwell Ho.	2·49
,,	Banbury, Bloxham	·92	,,	New Galloway, Glenlee	2·34
,,	Northampton, Sedgebrook	1·78	,,	Moniaive, Maxwelton Ho.	2·97
,,	Stamford, Duddington..	1·04	,,	Lilliesleaf, Riddell	3·15
,,	Alconbury	1·25	XIII.	N. Esk Res. [Penicuick]	4·95
,,	Wisbech, Bank House...	1·95	XIV.	Glasgow, Queen's Park..	3·69
IV.	Southend	1·30	XV.	Inverary, Newtown	5·27
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	5·54
,,	Colchester, Lexden	2·55	,,	Islay, Gruinart School ...	2·14
,,	Rendlesham Hall	2·87	XVI.	Dollar.....	3·20
,,	Scole Rectory	1·96	,,	Balquhidder, Stronvar...	4·58
,,	Swaffham	1·89	,,	Coupar Angus Station...	2·09
V.	Salisbury, Alderbury ...	·37	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	·53	XVII.	Keith H.R.S.....	2·82
,,	Blandford, Whatcombe .	·90	,,	Forres H.R.S.	2·82
,,	Ashburton, Holne Vic...	·83	XVIII.	Fearn, Lower Pitkerrie..	2·50
,,	Okehampton, Oaklands.	1·25	,,	S. Uist, Askernish	1·86
,,	Hartland Abbey	1·00	,,	Invergarry.....	1·69
,,	Lynton, Glenthorne ...	·78	,,	Aviemore H.R.S.	2·90
,,	Probus, Lamellyn	1·01	,,	Loch Ness, Drumnadrochit	2·47
,,	Wellington, The Avenue	·60	XIX.	Invershin	4·12
,,	North Cadbury Rectory	1·25	,,	Durness	3·30
VI.	Clifton, Pembroke Road	·68	,,	Watten H.R.S.....	2·15
,,	Ross, The Graig	·49	XX.	Dunmanway, Coolkelure	4·00
,,	Wem, Clive Vicarage ...	1·58	,,	Cork, Wellesley Terrace	1·62
,,	Wolverhampton, Tettenhall	...	,,	Killarney, Woodlawn ..	3·47
,,	Cheadle, The Heath Ho.	2·03	,,	Caher, Duneske	3·72
,,	Coventry, Priory Row ..	1·14	,,	Ballingarry, Hazelfort...	...
VII.	Grantham, Stainby	1·29	,,	Limerick, Kilcornan ...	...
,,	Horncastle, Bucknall ...	1·24	,,	Miltown Malbay	1·71
,,	Worksop, Hodsck Priory	1·70	XXI.	Gorey, Courtown House	3·77
VIII.	Neston, Hinderton	2·14	,,	Moynalty, Westland ...	2·67
,,	Southport, Hesketh Park	1·55	,,	Athlone, Twyford	1·78
,,	Chatburn, Middlewood.	2·05	,,	Mullingar, Belvedere ...	2·71
,,	Duddon Val., Seathwaite Vic.	4·50	XXII.	Woodlawn	1·52
IX.	Melmerby, Baldersby ...	1·85	,,	Crossmolina, Enniscoe ..	1·29
,,	Scarborough, Observat'y	2·07	,,	Collooney, Markree Obs.	2·01
,,	Middleton, Mickleton ...	3·80	,,	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	3·23	XXIII.	Warrenpoint.....	2·80
,,	Bamburgh	4·01	,,	Seaforde.....	3·17
,,	Keswick, The Bank.....	3·21	,,	Belfast, Springfield	2·88
XI.	Llanfrechfa Grange	·27	,,	Bushmills, Dundarave..	2·84
,,	Llandovery	2·60	,,	Stewartstown	2·79
,,	Castle Malgwyn	1·75	,,	Killybegs	4·29
,,	Brecknock, The Barracks	·82	,,	Horn Head	2·28

JULY, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·45	— 1·23	·89	22	10	89·2	20	50·9	5	0	0
II.		Tenterden	1·42	— ·93	·81	22	7	85·0	20*a*	49·0	5, 14	0	0
,,		Hartley Wintney	·42	...	·16	22	6	89·0	20	45·0	5, 28	0	0
III.		Hitchin	1·53	— 1·19	·55	23	10	88·0	19*b*	48·0	4, 27	0	..
,,		Winslow (Addington)	1·17	— 2·12	·61	22	8	88·0	19*b*	45·0	28	0	0
IV.		Bury St. Edmunds (Westley)	2·72	+ ·15	·83	22	7	79·0	20	49·0	5	0	..
,,		Norwich (Brundall)	1·87	...	1·06	23	6	85·0	20	48·6	18	0	0
V.		Winterbourne Steepleton ...	2·01	...	1·39	22	7	81·4	20	45·8	15	0	0
,,		Torquay (Cary Green)	·34	...	·12	22	6	79·5	30	51·7	16	0	0
,,		Polapit Tamar [Launceston]..	·99	— 2·42	·22	23	11	...	...	...	...	...	..
VI.		Stroud (Upfield)	1·03	— 2·54	·30	22	6	86·0	20	50·0	4	0	..
,,		ChurchStretton(Woolstaston)	1·29	— 1·68	·50	1	12	77·5	31	48·0	2	0	0
,,		Worcester (Diglis Lock)	1·44	— 1·43	·42	11	7	...	...	...	...	...	...
VII.		Boston	1·21	— 1·58	·36	23	9	87·0	12	48·0	5, 27	0	..
,,		Hesley Hall [Tickhill].....	·92	— 1·75	·27	12	9	85·0	31	46·0	16*c*	0	..
,,		Breadsall Priory	1·89	...	1·14	1	9	79·0	*f*	46·0	5, 25	0	..
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribston Hall) ...	1·20	— 1·98	·32	3	9	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·42	— 2·22	·87	12	11	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·59	— 1·00	1·14	12	7	81·0	11*c*	46·0	5	0	0
X.		Newcastle (Town Moor)	...	...	...	...	...	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	6·57	— 4·42	1·73	9	19	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	·81	— 3·25	·20	1	11	...	...	...	...	...	...
,,		Haverfordwest	2·31	— 1·90	1·19	10	9	81·5	31	43·6	29	0	0
,,		Aberystwith (Gogerddan) ...	3·25	...	1·08	1	8	86·0	20	...	...	...	...
,,		Llandudno.....	1·85	— 1·15	·39	20	10	...	...	...	...	...	..
XII.	SCOTLAND.	Cargen [Dumfries]	1·99	— 1·94	·76	11	9	80·0	31	45·0	5	0	..
XIII.		Edinburgh (Blacket Place)...	3·98	...	1·24	1	15	78·0	31	48·0	5	0	0
XIV.		Colmonell	3·68	...	1·50	11	13	79·0	5	47·0	4, 23	0	..
XV.		Tighnabruaich	5·05	...	·66	12	16	67·0	6	47·0	9	0	..
,,		Mull (Quinish).....	4·00	— ·05	·84	25	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	...	...	...	...	...	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·05	— 1·41	·45	12	14	82·8	30	47·7	9	0	..
XVII.		Braemar	2·39	— ·82	·45	1	15	76·0	30*d*	37·0	5	0	..
,,		Aberdeen (Cranford)	2·97	...	·55	18	16	77·0	29	46·0	4, 14	0	..
,,		Cawdor (Budgate)	3·35	+ ·05	·63	1	17	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·06	+ ·56	·65	28	11	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·57	...	1·26	28	23	70·1	31	45·4	9	0	..
XIX.		Dunrobin	3·18	+ ·33	·80	2	18	73·0	30	45·0	24	0	..
,,		S. Ronaldshay (Roeberry) ...	2·59	+ ·23	·50	25	18	67·0	6	47·0	8	0	..
XX.	IRELAND.	Darrynane Abbey.....	2·25	...	·41	10	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·00	— ·53	1·19	11	11	77·5	30	43·0	13	0	..
,,		Broadford (Hurdlestown) ...	2·12	...	·63	10	18	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	5·13	+ 1·61	1·89	6	15	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	3·12	+ ·44	1·40	11	12	74·9	5	49·1	13	0	0
XII.		Ballinasloe	1·87	— 1·68	·44	10	17	78·0	31	47·0	2	0	..
,		Clifden (Kylemore)	3·07	...	1·31	8	15	...	...	...	...	..	...
		Waringstown	2·82	— ·70	·78	11	11	73·0	29	43·0	3	0	0
		Londonderry (Creggan Res.).	2·23	— 1·89	·38	18	20	...	...	...	...	...	...
		Omagh (Edenfel)	2·54	— 1·18	·59	1	17	77·0	31	43·0	12	0	0

+ Shows that the fall was above the average ; — that it was below it.
d 21. *b*—and 20. *c*—and 19. *d*—and 31. *e*—and 17. *f* several days.

METEOROLOGICAL NOTES ON JULY, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Very dry and hot after the first week. Duration of sunshine 270 hours. Sharp TS on 6th from 0.28 to 1.30 p.m.; trees and buildings struck. Severe TS on evening of 22nd, with very heavy R; at Little Westwell, ¾-mile S.W. of Tenterden, 1·44 in. fell. L in evening on 21st; distant thunder on 23rd.

HARTLEY WINTNEY.—A very hot, dry month, with plenty of sunshine. The driest July recorded, the rainfall being ·07 in. less than in 1898 and 1·85 in. below the average. There were TSS to the S. or S.W. on the 20th, 21st, 22nd and 23rd, but the fringe of the cloud reached here on only 2 days. L on the 6th, 7th, 10th, 21st, 22nd and 23rd. Ozone on 9 days, with a mean of 3·2.

HITCHIN.—There have been only two hotter Julys in the last 50 years—1859, mean temp. 65°·3, and 1868, 64°·8. Mean for this month, 64°·7.

WINSLOW, ADDINGTON.—A very fine month, hot and dry. The max. temp. was 80° or above on 12 days, the greatest number ever registered here, the next greatest being 11 in 1887; the min. being above 60° on five nights. T on 7th, 17th and 23rd. The temp. at night was often high.

BURY ST. EDMUNDS, WESTLEY.—A very hot month. TSS on 1st, 7th and 23rd; distant T on 12th and 22nd.

NORWICH, BRUNDALL.—Mean temp. 63°·9, being the highest recorded in July since 1887. TS 11.30 a.m. on 1st, and severe from 4 to 5 a.m. on 23rd. T on 8th.

WINTERBOURNE STEEPLETON.—The temp. during the month was very high, and, with the exception of the rain, which fell principally on the 23rd, the weather was very dry. The mean temp. is 61°·6, which is the highest monthly mean recorded since observations began in 1893. The previous highest is 60°·8 in August, 1893. Fog on 10th, 11th and 14th; T in afternoon and L at night on 21st; slight TS between 3 and 6 a.m. on 22nd; T and L about 6 a.m. on 23rd.

TORQUAY, CARY GREEN.—R 2·20 in. below the average. Mean temp. 64°·4, being 3°·0 above the average. Duration of sunshine 306 hours 55 mins., being 106 hours 10 mins. above average; one sunless day. Mean amount of ozone at 9 a.m. 3·5; greatest 6·5 on 1st, least 1·0 on 12th, 19th, 27th, 28th and 31st.

POLAPIT TAMAR [LAUNCESTON].—A hot, dry, generally calm month, the total R being 2·07 in. less than the average for 18 years. Fog on 5th, 6th, 7th, 16th and 29th; T and L from 3.30 till midnight on 22nd; distant T on 23rd.

WOOLSTASTON.—An extremely hot and sultry month, with very little R after the first 11 days, which were showery. T on the 7th and 17th. Mean temp. 61°·9.

HULL, PEARSON PARK.—TS with heavy R and H in the evening on 12th, 1·14 in. fell in 40 mins.; T also on 7th, 8th and 17th.

WALES.

HAVERFORDWEST.—The month commenced cool and rainy, but was warmer from the 5th to the 9th. A very wet period then occurred up to the 14th, followed by fine summer weather, which continued to the end.

GOGERDDAN.—Very hot and sultry, with much bright sunshine throughout. A few thunder-showers.

SCOTLAND.

CARGEN [DUMFRIES].—The mean bar., 30·013 in., was unusually high, and was accompanied by fine warm weather; the mean temp. for the month, 60°·5, being the highest since 1877, while only in ten out of the last 40 years has the mean for July exceeded 60°. Considerably over the half of the total rainfall occurred in the three days 11th to 13th; on the first of these days a violent T8 took place lasting several hours. A continuance of fog during the third quarter of the month accounts for sunshine showing a total of 27 hours less than the average. Splendid weather for haymaking was experienced, but the rye grass crop proved light.

EDINBURGH, BLACKET PLACE.—Mean pressure ·148 in. above, and mean temp. 1°·1 above, the average. Sunshine below the normal. The mean minimum temp., 53°·7, is the highest since 1855, when the mean was 53°·8. Distant thunder on 2nd; T8S on 12th and 17th.

COLMONELL.—R ·23 in. above, and mean temp. 2°·8 above, the averages of 23 years.

TIGHNABRUAICH.—A month of high bar. pressure, the reading on only four days being below 30 inches, yet there was an average rainfall.

MULL, QUINISH.—A very warm and sultry month. Both pressure and temp. were unusually high throughout, the former never falling below 30·00 in. after the 2nd. R about the average, with a great many days of mist and fog. A difficult month for haymaking, but the growth of vegetation was wonderful.

ABERDEEN, CRANFORD.—Warm, with light winds and little sunshine, the sky often overcast. Strong winds from 26th to 29th.

S. RONALDSHAY, ROEBERRY.—A very fine month up till the last week, which was very rough and stormy. Mean temp. 56°·3, or 1°·8 above the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—Rather wet at the beginning of the month; very hot during the last few days. T on 20th and 22nd.

WATERFORD, BROOK LODGE.—Sea fog on 4th, 19th and 21st. T on 5th, 20th and 22nd. H on 5th. Lunar halo on 22nd.

BROADFORD, HURDLESTOWN.—R 1·04 in., and rainy days 1, less than the average of 14 years. On the 22nd, between 4 and 5 p.m., there were two distinct T8S going on at the same time; one to S.W., the other to S.E.

CARLOW, BROWNE'S HILL.—On the 11th, 1·75 in. of R fell in an hour-and-a-half.

DUBLIN, FITZWILLIAM SQUARE.—A warm but changeable month, with very cloudy skies and occasional heavy rains. Winds from westerly points largely predominated. Mean temp. 61°·8, or 1°·6 above the average. High winds on 5 days, and a moderate gale on 26th. Temp. reached or exceeded 70° in the screen on 11 days, while in July, 1887, it reached or exceeded 70° on no fewer than 17 days. T8 on 6th; T on 17th. Solar halo on 8th. Fogs on 19th, 20th, 21st, 22nd and 31st.

OMAGH, EDENFEL.—Until the last week the weather of the month was fitful and uncertain, with but little sunshine, a warm humid atmosphere and occasional heavy rains, favourable for growth but rendering hay saving difficult. The last week was fine and dry and progressively warmer until the last day, which was the beginning of a hot spell running into August.

No. CCCCIV.]
VOL. XXXIV.

[PRICE FOURPENCE.
Or 5s. per annum post free.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
Cuttings: Electric Snow—A Compass Plant—Trees and Change of Temperature—The Rainbow Beauties of Windermere—Persian Rainfall	113
The Moon and the Weather	117
REVIEWS:—	
Lightning and the Electricity of the Air	118
Nedbørsagttagelser i Norge udgivet af det Norske Meteorologiske Institut	119
Meteorologiske Middeltal og Extremer for Færoerne, Island og Grønland	120
Thunderstorm on August 15th	122
Results of Meteorological Observations at Camden Square during August for 40 Years, 1858-97	123
Climatological Table for the British Empire, March, 1899	124
Supplementary Table of Rainfall, August, 1899	125
Rainfall and Temperature in August, 1899, at 50 Stations ...	126
Meteorological Notes on August, 1899	127

SEPTEMBER, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

BRITISH RAINFALL.

Subscriptions of £1 or upwards received between August 11th and September 11th :—

	£	s.	d.
Gosling, Col.	1	0	0
Graham, P. N., Esq.	1	1	0
Hill, J. Hamford, Esq.	1	10	0
Law, H., Esq., C.E.	2	2	0
Murray, H. B., Esq.	1	10	0
Rivington, C. R., Esq.	2	2	0

THE OBSERVATORY;

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., Sec. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Ro
Meteorological Societies, and of the British Astronomical Association; Artic
by various eminent Astronomers, English, American, and Continen
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assista
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu
publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

*All communications should be addressed to the Editors of "The Observato
Royal Observatory, Greenwich, S.E.*

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 2

NOTICES.

It is requested that all Books for Review, and Communications
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in
letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCIV.] SEPTEMBER, 1899. [PRICE FOURPENCE, *or 5s. per ann. post free.*

CUTTINGS.

THIS magazine is so largely occupied with original matter that we can rarely insert anything else; but it seems a pity never to relax—so we are reprinting a few items which we think will be of general interest.

ELECTRIC SNOW.

The story of a very remarkable snow-storm, is told, says "Science Siftings," by Lieutenant John P. Finley, one of the best informed meteorologists in the United States, who encountered the storm in making an ascent of Pike's Peak. He says that the storm could be described as a "shower of cold fire." In reality it was so charged with electricity as to present a scene more easily imagined than described. At first the flakes discharged their tiny lights only on coming into contact with the hair of the mule on which the lieutenant was mounted. Presently they began coming thicker and faster, each flake emitting its spark as it sank into drifts of the snow, or settled on the clothing of the lieutenant, or the hair of the mule. As the storm increased and the flakes became smaller, each of the icy particles appeared as a trailing blaze of ghostly white light; and the noise produced by the constant electric explosions conveyed an expression of Nature's power which Lieutenant Finley will never forget. When the storm was at its height and each flake of snow was like a drop of fire, electric sparks were shaken in streams from the Lieutenant's finger tips as well as from his ears, beard and nose, and a wave of his arms was like the sweep of flaming sword-blades through the air, every point of snow touched giving out its little snap and flash of light. This phenomenon, though rather rare, is by no means new to meteorologists, it having been recorded several times before. By some authors, it seems to have been treated as a sort of phosphorescence, but if Lieutenant Finley's description is correct there can be no doubt that in this case each flake was charged with electricity.—*Globe.*

Lieutenant Finley is so skilled an observer that the above may be implicitly trusted. As regards the streams of sparks from his finger tips, we once had the privilege of being shown by Prof. Mascart the electric installation of the Grand Opera at Paris, and in a brilliantly lighted basement, he showed us the electric energy present, by holding his hand within a foot or so of a driving-band, when each separate finger had at its extremity a brush discharge from

2 to 3 inches long. In the dark they would probably have been twice or thrice as long. Trying it ourselves, we saw the same blue flame, and found it quite painless. Electric engineers are doubtless accustomed to it, but to have St. Elmo's fire on our finger tips was to us a new experience.

A COMPASS PLANT.

On some of the prairies in America is found what is called the compass plant, of great value to travellers. The long leaves at the base of its stem assume a vertical position, and point north and south. Travellers on dark nights have only to feel the edges of the leaves to ascertain the points of the compass.

If the leaves "assume a vertical position" how do they "point north and south"?

TREES AND CHANGE OF TEMPERATURE.

It looks as if we were gradually but surely passing to a lower general temperature in these latitudes. Observation does not, it is true, show that the mean temperature is lower than it was a century ago; but the disappearance of many plants which formerly flourished on this island and in Central Europe seems to indicate that such a change is in progress. A writer in *La Semaine Horticole* draws attention to certain changes which have occured and are occurring in France at the present time, which favour the idea that the climate is becoming cooler. Many trees that formerly flourished in the North of France are no longer found there, and can only be met with in the extreme south, while several have entirely disappeared from the country. The lemon, once so general and prevalent in Languedoc, no longer grows there, and an orange tree cannot be found in Roussillon, where orange groves existed long ago. The Italian poplar so common and so picturesque in ancient French etchings, is now rarely found on French soil, and only in the southern part of the Republic. France was of old the fruit garden of Europe; but the changes of temperature have greatly limited the number and variety of fruits which can be grown in that country, and considerably restricted the area in which they flourished.—*English Mechanic, 17th December, 1897.*

THE RAINBOW WONDERS OF WINDERMERE.

"About the first week in October," writes Wordsworth in his "Guide to the Lakes," "the rich green which prevailed through the whole summer is usually passed away, the brilliant and various colours of the fern are then in harmony with the autumnal woods; bright yellow or lemon colour at the base of the mountains, melting gradually through orange to a dark russet-brown towards the summits, where the plant, being more exposed to the weather, is in a more advanced state of decay."

Wordsworth was a faithful observer of the changes of the varying year at the English Lakes, but he would have been obliged to confess that there is no rule without an exception, and that this year the exception holds good. It is true that a Spanish chestnut here and there or a wild cherry upon an upland slope has changed colour, but to-day is the 4th of October, and there is hardly a speck of amber in the woods. A greener autumn can hardly be imagined; yet for all the mellow mistfulness of to-day the wind is going eastward; and if the heavens be clear to-night, and Cassiopeia be bright at the Zenith, we may have

all the larches yellow, and all the brackens gleaming gold to-morrow morn. So runs my diary for October the 4th.

But the heavens were not clear; the mists gathered in a fleecy cloud bed upon the bosom of the lake, and gradually floated upward till all that we could see from our cottage on the Furness Fell were the purple tops of the Fair field range, and the summit of Woden's fell—the Wansfell or Wonsfell of our modern day.

"The morning rose in memorable pomp," the flush of dawn fell upon the steady cloud-pack of mist in the valley, and in a moment as it seemed the quiet sea of vapour was stirred into life; there were writhings innumerable, and the whole mass of soft restfulness became convulsed with passionate movement. Then from beneath the ascending vapour, the sun, reflected in the water, "gleamed upward like the flashing of a shield," and we went down through the roses and the dahlias and the giant lilies still untouched by frost, through the woodland still un-umbered by the touch of October, down through the bracken slopes as green as June, towards the lake shore of Winandermere. Half an hour ago it had seemed as if there would never be sun any more, so densely obscured was the great day star by the white mists that steamed upward. Now we were rejoicing in sunshine that seemed as bright as August noon, by a lake that shone as fair and blue almost as an Italian water-flood. There was no ripple on the mere, and when we pushed out into middle lake, so marvellous were the reflections of fell and wood, so transparent the depths, that one could hardly tell whether we were upon water or suspended in middle air.

Suddenly my companion cried, "Look at the rainbows! look at the rainbows!" Gazing south towards "Belle Isle," one saw the whole water iris-hued, as if all the rainbows that had ever sprung from earth to heaven, had melted into the bosom of the lake, and filled the sunny depth with liquid iridescence.

Slowly we rowed towards them, and the rainbows stayed for us till our boat pushed into the lucent flood, and then as we moved forward on each side our wake, the rainbows curved and quivered, and sprang like horns of multi-coloured light to right and left, and lengthening out, shone far astern. On we went, wondering at the glory and the glow. Our boat's motion seemed momently to kill the marvellous prismatic flood, but it was only for a moment that the rainbows faded, and again, beyond the ripple and the washing of our oars, there sprang into being new rainbow-tinctured beauty of liquid purple shot with green, and orange, and rose, and behind us, as well as before us, the lake mirror lay one mighty opal, one flood of lucent pearl and fire.

Beyond the rainbow lustres far away the lake seemed to have been silvered over with frost; one could have staked one's life, unless one's eyes were playing one false, that the ice-king had been at work, and the thin ice mirrors he had made were powdered with the hoary rime. But as one neared it the phantom ice-floe faded, and nothing but liquid rainbows for the keel to cleave and fashion again to wondrous loveliness, and the finest dust like floating meal remained where before we might have supposed was a fair field for the skater's joy and curler's game.

It was rainbows, rainbows all the way! and what was the cause of this October glory of rainbow flood? It was nothing in the world but a smooth lake surface and the fine dust of the pollen of a humble water-plant—some say

the pollen of the American water-weed Vallisneria, others aver it is the gold dust of the water-lobelia, which, floating upward through the tranquil water on a calm October day, lies on the surface of the polished lake-mirror with power to change the face of the water into such a refracting and diffracting medium as to splinter all the sun into iridescence, and unravel the beam of white light into the colours of the prism.

It seems that the water must be of a certain temperature to encourage the plant to send forth its prism-makers to the surface. No breath in Heaven must stir if the lake-mirror is to work its magic charm. Only on rare days such as was October the 5th could Windermere be clad in rainbow hue. One may live by the shore of the lake for another fifteen years before one may be fortunate enough to witness again the glorious phenomenon of yesterday, or be privileged to push one's shallop through a league of liquid iris, or row through miles of rainbow.—*Daily News, 12th October, 1898.*

The writer's language is as brightly coloured as are the phenomena he describes. They are, perhaps, hardly meteorological facts, but so little over the border line that we may be excused for quoting the account. We have also another reason for reproducing it. We do not impeach the accuracy of the antecedent account, but we once saw on Derwentwater a sight equally beautiful, of which we assumed another explanation. It also was on a very calm day, in early autumn; we were in a small boat, nearly in the centre of the lake, and merely using an oar occasionally to prevent drifting, when we noticed, away to the N., lying on the lake, not a mere rainbow, but a spectrum far more brilliant than any rainbow we ever saw. We thought, but it might have been fancy, that we could trace variations in its brilliancy when wavelets, produced by dipping our oars, had reached its apparent position; and having only the "dangerous" knowledge (*i.e.*, very little) of optics, we thought that we quite understood it, and contented ourselves with admiring, instead of investigating, it.

Our theory, which perhaps some one versed in optics will demolish, was, that as our eyes were so near the level of the water, the crests of the wavelets acted as a diffraction-grating and broke up the sunlight into its component parts. That seems to be the idea of the writer in the *Daily News*, but he brings in the pollen as the diffracting agent.

PERSIAN RAINFALL.

It appears, from a Consular report from Meshed, Persia, that the rainfall there last year was only 9·58 inches, the number of wet days being 44. The year, nevertheless, was one of the wettest on record, and absolutely the wettest since the beginning of the present decade. The average annual rainfall seems to be no more than between 4 and 5 inches. In 1891, it reached 5·73, and in 1895, 8·78. But in 1893, a year of general drought, it was only 3·46 in. Those in search of a dry climate, therefore may be recommended to turn their attention to Meshed. A really wet day, such as we rarely experience in Newcastle, but such as is a common occurrence in Cumberland and Westmoreland, yields as much moisture in a few hours as Meshed gets in a twelvemonth, and would cause the inhabitants of the Persian city to think that the Day of Judgment had come.—*Newcastle Chronicle, 26th October, 1897.*

THE MOON AND THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—I fear I must not consider myself a "thoughtful meteorologist," as I am prepared to assert most emphatically that the moon has no influence upon the motion of high and low pressure areas; also, if Prof. Hazen has waded through as much matter on the subject of the moon's influence on the weather, and of the same character, as I have, his "vehemence," I think, is easily explained.

We know the moon's radiant heat to be infinitesimal, and we are able to calculate so accurately the effect of the mutual attraction of the earth, sun and moon, that we can foretell the time and position of a solar eclipse many years hence with the greatest precision.

Although much may remain to be discovered, it cannot be said that we are ignorant of the two chief ways in which the moon might influence the weather. The heat is so small that it may certainly be neglected. The same science which enables us to assign to the moon its precise position in the sky for hundreds of years to come enables us also to assert that the only result of the moon's attraction on our atmosphere is a small aërial tide—a tide which is so small that it can hardly be detected by the barometer. Air being non-magnetic, we can hardly conceive of any magnetical action, and an electrical effect seems equally improbable.

To prove an inherently improbable event very strong evidence is required, but the evidence offered for most of these theories is of the flimsiest description. In fact, a careful search would unearth many pairs of mutually destructive theories—that it rains most at the time of new moon; that it rains least at the time of new moon, &c.

We have, roughly, one hundred years record of the weather, and were there any real connection between it and the moon, it seems likely that it must indisputably have appeared before now.

Careful search for any sort of weather connection should not be discouraged; but if the authors of these theories would study the laws of probability, and apply them rigidly before publishing, it would save the waste of much paper. Take any purely chance numbers, such as the figures after the decimal in a daily temperature column, or the numbers given by a throw of dice. It is very unlikely that the average of ten throws with the left hand will coincide with the average of ten throws with the right hand; and if the numbers be extended to fifty, there may even then be a fair difference between the averages. The averages of alternate figures in the temperature column will show the same discrepancy. Similarly with the moon; if the rainfall for fifty lunations be greater or less at full moon than at new moon, it by no means follows that there is a connection between the fall of rain and the age of the moon, since *à priori* we may naturally expect to find a difference. Considering the many independent elements of variation both of the moon and of the weather, it would be odd if some accidental coincidences in the changes of the various elements did not occasionally happen.

September 2nd, 1899. W. H. DINES.

REVIEWS.

Lightning and the Electricity of the Air, prepared under the direction of WILLIS L. MOORE, U.S. Weather Bureau, by ALEXANDER G. MCADIE and ALFRED J. HENRY. Bulletin No. 26. Weather Bureau, Washington, 1899. 8vo. 74 pages, many engravings and plates.

IN the States this can be bought for half a dollar, we wish that some enthusiast would import a few hundred copies, sell some at half a crown each, and stir up our educational authorities to distribute the remainder to our schools, and thus instruct the children and save lives.

We do not suggest that the pamphlet could itself be put into children's hands,—but that a master would find in it good material for teaching his pupils the general features of atmospheric electricity, thunderstorms, and injury by lightning; while the excellent photographs would give them an object lesson which would prevent their ever running under a tree for "shelter!" However, we suppose that such knowledge would not secure "marks," and therefore probably another generation will be allowed to "shelter" in the worst place possible.

No one, however, must run away with the idea that this is a mere elementary or "paste and scissors" pamphlet. It does contain much that has been said before, it would be useless if it did not; but each of its two sections is extremely well arranged and supported by the best available data.

The lack of esteem for prophets in their own country is proverbial, it is therefore with some satisfaction that we see the following paragraph in Mr. McAdie's paper:—

> In 1882 appeared the report of the Lightning Rod Conference; in many respects the most important contribution to the literature of the subject yet made. While so many foreign governments, and in particular France, had by means of officially constituted boards taken a governmental interest in the protection of the people from the dangers of lightning, the English speaking people of the world, aside from the few directions officially issued for the protection of magazines and lighthouses, remain without any authoritative utterance upon the subject: and while this conference itself did not have strictly official sanction, it carries, from the character of its make-up, a weight certainly as great as, if not greater than, an official board. It was simply a joint committee of representative members of the Institute of British Architects, the Physical Society, the Society of Telegraph Engineers and Electricians, the Meteorological Society, and two coöpted members. As might have been anticipated from such auspices, the report is an excellent one, and must stand for years as the embodiment of the most widely gathered information and well considered decisions. The report is emphatically one based upon experience.
>
> The famous free-for-all discussion which occurred at the British Association Meeting in 1888, as far as our judgment goes, simply proved that the decisions of the conference could not at present be disregarded. As the president of the meeting, Sir William Thomson, said, "we have very strong reason to feel

that there is a very comfortable degree of security, if not of absolute safety, given to us by lightning conductors, made according to the present and orthodox rules."

Part II. deals chiefly with injury by lightning, and statistics as to the number of deaths, of fires, &c., in different years, and in different countries. It contains three beautiful photo-electros of damaged trees, a walnut and two oaks. These induce us to mention an opinion which we have long held, viz., that it is easy for anyone who hardly knows an oak when he sees it growing, to pick out, from a series of photos of trees struck by lightning, all the oaks. We should be glad if any of our readers who have photographed damaged trees would favour us with copies. We would see whether it were possible to reproduce a series of types. For instance, Mr. Henry intimates that when a maple is struck it is rare for any injury, except a groove, to be perceptible, whereas an oak is splintered like a birch broom. We used to think that this disruptive action was caused by the conversion of the sap into high pressure steam, but we gave up that idea after examining the rafter of a house which had been split into shreds, like wooden matches, although the wood was absolutely dry and sapless; this showed that the cause must be electrical repulsion between the particles of wood all similarly electrified. But if so, why is oak so splintered? and why is not maple, or poplar?

Nedboriagttagelser i Norge udgivet af det Norske Meteorologiske institut. Aargang I., II. og III. Two parts. Kristiania, 1899. Fol., 152 and 218 pages, 2 maps and 4 tracings.

Two excellent works; but Dr. Mohn was a regular attendant at the Official Meteorological Congresses, at which we thought that it was decided that it was desirable that meteorological publications should be uniform in dimensions, and here we have two handsome publications which will not go comfortably on anybody's shelves, and which are sure to suffer accordingly. They are 16 inches high by 11 inches broad, and we can see no reason whatever for these unusual and uncomfortable dimensions.

Having recorded our protest—which, moreover, applies to others besides Dr. Mohn—we turn to the more pleasant duty of reporting what the volumes contain.

Part I. gives the daily rainfall from July 1st, 1895, to December 31st, 1897, at about 200 Norwegian stations.

Part II. gives monthly summaries for all the stations at work during 1895–97 (about 400), and also various remarks, summaries, and an introduction.

On pages 206–209 there is a very useful table which gives the total rainfall in each year from 1867 to 1895 inclusive, at every station at which any record was kept for any one or more of those

years. There are only seven returns for the first year (1867), and of these Kristiania, Mandal, Skudenes, Bergen and Aalesund are perfect for the whole period of 29 years.

It will be useful to give some data for these stations.

	Kristiania	Mandal.	Skudenes.	Bergen.	Aalesund.
Latitude N.	63° 7′	58° 2′	59° 9′	60° 23′	62° 28′
Longitude E.	7° 45′	7° 27′	5° 16′	5° 21′	6° 10′
Altitude (feet)	52	56	13	72	46
Mean R. (in.)	22·95	52·20	45·00	73·09	43·54
Max. Total (in.)	38·82	75·04	57·95	111·58	66·59
,, Year	1877	1891	1877	1887	1893
,, % of Mean	169	144	129	159	153
Min. Total (in.)	16·26	31·02	31·46	43·82	27·21
,, Year	1871	1875	1875	1870	1872
,, % of Mean	71	59	70	60	62

Bergen has long been known to have a large rainfall, and it will be seen that the average is 73 inches. Apparently the wettest place in Norway is Farstveit,* in Lat. 60° 50′ N. and Lon. 5° 56′ E., about 350 feet above sea level, at which place the average rainfall is 90 inches, or about half that of the wettest English station.

We congratulate Dr. Mohn upon this useful publication, and upon the beauty of the typography and of the maps.

Meteorologiske Middeltal og Extremer for Faroerne, Island og Grønland. [Meteorological Means and Extremes for the Faroe Islands, Iceland and Greenland.] Appendix to the danske meteorologiske Instituts Aarbog, 1895, II. Del. Copenhagen, 1899, 4to, 32 pages, 1 map.

We thank Dr. Paulsen heartily for this very useful paper, but we wish that he had added a few more pages of text. He is, of course, familiar with the instruments used at these nine stations, with their mounting, and with the environments of each, but there is not a word upon the subject in the text, nor any reference to any other work in which such information is given—so that those who have not visited the stations are left very much in the dark.

We have applied some rather severe tests to the barometric records and they seem to be excellent; we, therefore, assume that the other elements are equally trustworthy, except where distinct warning to the contrary is given—as for example, in the statement that at four of the stations there was no *maximum* thermometer.

As this paper deals chiefly with means and extremes, dates are of minor importance, but we should certainly have given for each

* At the head of a Fjord some 50 miles N.E. of Bergen.

station the years upon which the records are based. We *infer* that the latest year is in all cases 1895, and that therefore, *e.g.*, at Berufjord the "23 years" were 1873–95, but we cannot be sure. We regret this omission, because in preparing the following table we should have liked to show whether the greatest, and the least rainfall, occurred in the same year, or in different years at the respective stations. However, we give what we can :—

Details as to Rainfall.

	Faroe.	Iceland.				Greenland.			
	Thorshavn.	Berufjord.	Grimsey.	Stykkisholm.	Vestmanno.	Ivigtut.	Godthaab.	Jacobshavn.	Upernivik.
Latitude N.	62° 2′	64° 40	66° 34′	65° 5′	63° 26′	61° 12′	64° 11′	69° 13′	72° 47′
Longitude W.	6° 44′	14° 15′	18° 3′	22° 46′	20° 18′	48° 11′	51° 46′	50° 55′	55° 53′
Altitude (feet)	31	59	8	37	26	16	37	41	12
No. of Years	25	23	16–22	18–23	15	21	19–23	21–23	21
Mean yearly Rain (in.)...	62·73	43·76	14·72	24·57	49·83	48·61	26·45	8·50	8·90
Max. yearly Rain (in.)...	77·01	68·39	25·85	29·50	62·48	72·50	35·61	14·68	17·77
,, ,, ,, % of Mean	123	156	176	120	125	149	135	173	200
Min. ,, ,, (in.)...	52·28	22·50	6·59	14·95	37·25	20·87	15·66	5·26	3·35
,, ,, ,, % of Mean	83	51	45	61	75	43	59	62	38
Max. in 24 hours (in.)...	2·46	4·31	1·35	2·04	2·46	5·88	3·30	1·43	2·07
Month, Wettest	I.	XII.	X.	IX.	IX.	X.	IX.	VIII.	VIII.
,, Driest	VI.	VII.	IV.	IV.	V.	IV.	IV.	II.	VI.

Remarks.

Double figures as to the number of years are given for four stations. We presume that at these stations some monthly records have been lost ; so that the final yearly mean is the total of twelve monthly means, which are based, some upon one number of years, some upon another.

We do not know the reason for the rapid decrease in the fall of rain with increase of latitude in Greenland. It will be seen that taken to the nearest inch it is in—

Lat. 61° ... 49 inches.	Lat. 69° ... 9 inches.
,, 64° ... 26 ,,	,, 73° ... 9 ,,

Is it possible that at these latter Arctic stations, where the fall must be chiefly snow, the mode of measuring it needs more care than it receives ? A fall of 3⅓ inches in a whole year would not provide many icebergs for the N. Atlantic,

We are also doubtful as to the record of rainfall at Grimsey ; it is an Island station, perhaps a lighthouse, exposed, and wind swept. The return is much the lowest of the four, and is about half that

reported for Reikiavig by Dr. Thorsten for 1829–37, in *Collectanea Meteorologica*.

As regards seasonal rainfall, the figures, though irregular, seem to show that the wettest month is generally in the latter half of the year, most frequently in September. The driest month is usually in Spring, most frequently in April. The mean annual temperature at Upernivik is 16°·2 F., and the lowest observed is —41°·1 F., *i.e.*, 73° below freezing point. At Jacobshavn it was once rather colder, viz., —43°·6 F.

THUNDERSTORM ON AUGUST 15TH.

THUNDERSTORMS prevailed between 2 and 7 p.m. on this date over an area which (roughly) may be said to have been bounded on the S.E. by a line reaching from Salisbury to Norwich, and on the N.W. by a line from Gloucester to Boston.

As heavy rains have lately been very scarce, we give all the returns exceeding an inch, in the order of their amount. We are inclined to think that the largest amount is too *small*, our impression being that the gauge ran over.

	in.	
Wallingford	3·10	
Dorchester, Oxfordshire	2·37	
(1) Manor Ho., Long Wittenham, Berks	2·35	(1) 1·75 in. fell in 50 mins.
(2) Letcombe Regis, Wantage, Berks	2·25	(2) All fell between 2 & 5 p.m.
Drayton, Wallingford	2·20	
Lovegrove's Cottage, Long Wittenham	2·17	
(3) Pyrton Manor, Watlington, Oxon	2·04	(3) All fell between 3 & 8 p.m. and 1·58 in. fell between 3 and 3.45 p.m.
Dorchester, Oxfordshire (Mr. Latham)	1·97	
Sedgbrook, Northampton	1·61	
Abingdon, Berks	1·53	
Swaffham, Norfolk	1·52	
Milton, Didcot, Berks	1·50	
(4) Culham, Abingdon	1·25	(4) Storm from S.W., 2 to 5 p.m.
Elm, Wisbech	1·22	
Magdalen College, Oxford	1·10	
Alconbury	1·04	
St. Giles, Oxford	1·00	

Taking merely the district round Abingdon, there seems to have been an area of 135 square miles with an average fall of 1½ inches. This would equal (taking 1 in. of rain per square mile as 14 million gallons) 2,835,000,000 gallons of water deposited in about 3 hours, or about 13 million tons weight. How many locomotives would have been required to deliver that load in three hours?

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

AUGUST.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	1·10	7	·61	0	61·6	57·4	84·5	74·9	42·4	52·4	..	..	..	..	4·8
1859..	2·65	14	·46	0	63·0	59·3	87·1	74·1	46·9	54·7	..	..	..	..	4·9
1860..	4·48	26	·77	0	58·1	55·0	70·3	66·6	44·8	51·8	..	..	38·7	48·9	7·4
1861..	·94	9	·24	0	62·6	58·8	89·5	75·6	46·2	53·8	..	..	40·0	48·7	5·0
1862..	2·74	11	·94	0	59·2	55·6	79·6	70·9	43·7	51·4	..	..	34·3	46·9	6·0
1863..	1·44	13	·54	0	61·8	57·8	83·8	73·3	45·1	54·2	..	..	37·8	49·9	6·3
1864..	1·33	6	·57	0	59·9	55·7	89·4	74·4	38·2	49·0	..	..	31·9	45·7	4·7
1865..	4·10	16	1·01	1	59·4	57·1	78·7	71·7	43·4	51·8	..	..	36·8	47·7	5·3
1866..	2·76	17	·87	0	59·5	56·6	80·0	71·6	40·7	52·3	..	..	34·9	44·2	6·7
1867..	2·63	10	·89	0	62·9	59·2	88·2	73·4	40·9	54·4	..	..	35·6	49·7	5·6
1868..	2·28	12	·53	0	63·7	59·3	88·2	73·9	46·0	54·7	..	..	44·8	53·0	6·9
1869..	1·26	9	·28	0	61·0	56·2	89·0	73·3	42·0	51·5	..	..	36·5	48·1	5·5
1870..	2·69	8	·85	0	60·9	57·1	82·5	73·4	40·5	53·5	134·0	119·2	36·4	49·2	4·8
1871..	·85	7	·62	0	65·1	60·0	90·0	77·9	46·2	54·2	127·5	119·4	42·6	52·2	2·0
1872..	2·05	12	·38	0	61·2	57·4	83·0	72·6	43·4	52·8	127·8	114·9	43·2	51·9	4·7
1873..	2·87	16	·87	0	62·1	58·4	86·4	73·9	47·7	54·6	132·7	120·2	43·2	51·2	5·4
1874..	1·32	16	·28	0	60·7	57·3	84·0	72·2	45·5	52·1	129·3	112·2	44·3	50·2	5·9
1875..	1·79	12	·66	0	62·5	59·0	86·1	74·7	45·3	55·0	131·0	116·2	41·8	51·8	5·5
1876..	1·79	12	·42	0	63·3	58·6	92·3	76·0	43·8	54·4	131·2	119·7	38·0	50·6	4·9
1877..	2·23	17	·55	0	62·6	57·9	82·9	72·8	42·4	55·0	130·0	118·4	39·3	52·4	5·8
1878..	6·72	22	1·41	1	62·3	59·1	79·4	72·6	50·1	55·8	127·8	116·2	47·3	52·8	7·2
1879..	5·11	16	·82	0	60·1	56·9	78·3	69·9	44·8	53·8	131·9	108·7	40·6	50·9	6·9
1880..	·45	4	·21	0	62·6	59·3	82·6	74·5	47·8	55·9	131·4	115·4	44·8	53·8	6·3
1881..	4·89	19	·84	0	59·1	55·5	84·6	69·3	42·3	51·3	126·3	110·6	37·8	47·7	6·5
1882..	1·48	12	·39	0	60·1	56·1	80·8	70·6	45·0	52·7	128·3	111·8	40·2	49·3	6·3
1883..	·93	10	·39	0	62·1	57·6	82·7	73·4	46·9	54·2	124·8	113·2	37·2	49·6	5·6
1884..	·89	10	·30	0	65·6	59·9	92·0	77·1	45·7	54·5	125·4	112·2	38·7	52·7	3·6
1885..	·85	12	·25	0	57·8	53·6	79·3	69·2	43·3	51·0	122·7	105·4	36·7	45·9	6·0
1886..	·76	12	·14	0	61·8	57·9	88·4	73·9	44·6	54·6	124·4	114·6	39·0	49·7	5·1
1887..	3·15	8	1·44	1	61·9	56·3	88·5	74·4	42·5	52·5	129·2	113·9	40·3	49·9	5·0
1888..	3·61	14	1·39	1	59·2	55·8	84·6	69·3	43·9	52·1	126·6	109·1	38·4	48·0	5·8
1889..	1·80	16	·31	0	59·7	56·2	84·4	70·5	44·2	52·6	125·9	110·2	40·2	49·0	5·7
1890..	1·55	13	·40	0	59·1	55·7	79·7	69·9	40·4	52·5	124·6	111·4	38·4	50·3	5·9
1891..	4·75	22	1·44	1	58·8	55·6	75·8	68·2	43·2	52·7	126·2	110·8	39·3	49·1	7·1
1892..	3·06	17	1·71	1	61·5	57·4	82·1	72·6	43·1	53·7	126·7	113·3	37·3	49·4	5·6
1893..	1·61	11	·78	0	65·5	59·5	93·6	77·1	44·8	56·4	131·9	117·8	39·0	52·3	4·9
1894..	2·85	18	·90	0	59·7	56·4	79·3	69·2	44·3	53·3	124·9	107·5	41·9	50·7	7·0
1895..	3·09	18	·67	0	61·4	57·6	81·3	72·2	46·0	54·2	123·8	113·3	41·0	50·3	5·1
1896..	1·92	14	·37	0	59·6	55·5	77·1	69·9	45·4	51·6	123·9	109·9	40·1	46·9	5·8
1897..	2·92	16	·76	0	62·8	58·6	88·4	73·6	48·1	54·8	130·1	116·2	42·4	49·9	5·2
Mean ...	2·39	13	·68	0·2	61·3	57·4	84·0	72·6	44·3	53·3	127·9	113·6	39·5	49·8	5·6
Extremes	6·72	26	1·71	1	65·6	60·0	93·6	77·9	50·1	56·4	134·0	120·2	47·3	53·8	7·4
	·45	4	·14	0	57·8	53·6	70·3	66·6	38·2	49·0	122·7	105·4	31·9	44·2	2·0

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1899.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	61·1	29	19·9	21	50·2	32·1	35·8	84	106·7	20·8	·50	8	5·1
Malta	76·9	23	44·9	29	63·8	51·9	49·5	80	133·9	39·9	·84	7	2·5
Cape of Good Hope	93·6	1	53·1	22*e*	78·9	59·7	56·4	73	...	...	·43	1	2·5
Mauritius	85·3	29	70·2	15	83·0	73·9	71·5	81	163·8	65·3	12·13	24	6·3
Calcutta	99·7	18	62·7	4	94·7	70·2	64·0	58	132·5	52·5	·01	1	1·0
Bombay	89·4	29	70·0	2	86·5	73·7	70·2	72	132·4	61·8	·00	0	0·4
Ceylon, Colombo	93·2	14*a*	70·0	9	91·2	73·7	72·2	79	153·9	67·5	·88	6	3·0
Melbourne	98·2	15	48·0	20	78·2	56·8	51·7	61	153·4	43·0	2·98	7	4·6
Adelaide	103·3	8	51·4	22	83·2	61·0	51·1	50	156·0	44·9	1·26	7	3·8
Sydney	90·4	23	56·8	21	77·6	62·5	59·7	66	141·5	45·9	1·76	14	3·5
Wellington	76·0	20*b*	41·9	15	67·5	54·1	50·7	69	127·0	35·0	4·58	12	4·2
Auckland	77·0	1	52·0	10	70·7	57·6	53·9	70	137·0	49·0	2·20	10	4·0
Trinidad	90·0	20*c*	64·0	7, 24	87·0	67·2	68·0	72	164·0	61·0	1·00	9	...
Grenada	86·0	21*d*	68·4	2	81·3	71·2	68·9	77	154·0	...	2·85	16	2·0
Toronto	56·8	11	4·9	21	34·3	21·5	23·7	79	73·8	1·5	4·28	16	6·6
New Brunswick, Fredericton	50·8	6	11·7	15	34·7	14·7	16·5	65	...	...	4·52	15	6·5
Manitoba, Winnipeg	29·2	24	—34·8	6	16·1	—9·8	...	...	...	...	·36	4	4·4
British Columbia, Esquimalt	54·8	29	28·0	25	48·5	35·7	...	...	...	...	2·45	15	6·4

a—18. *b*—23. *c*—27, 28. *d*—28. *e*—24.

REMARKS.

MALTA.—Adopted mean temp. 56°·7, or 0°·8 above average. Mean hourly velocity of wind 12·3 miles, or 1·4 above average. Mean temp. of sea 62°·0. H on 26th.
J. F. DONSON.

Mauritius.—Mean temp. of air 0°·5, of dew point 1°·6, and rainfall 3·87 in. above, their respective averages. Mean hourly velocity of wind 10·3 miles, or 0·3 above average; extremes, 43·5 on 6th and 0·0 on 13th; prevailing direction E.S.E. to E. by N. and variable. L on 7th, T on 15th, 17th, 27th and 28th, and L T on 18th and 30th.
T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 80°·2, or 1°·7 below, of dew point 0°·6 below, and rainfall 4·08 in. below, their respective averages. Mean hourly velocity of wind 6·6 miles; prevailing direction S.W. T8S occurred on 6 days; L on the 1st only.
H. O. BARNARD.

Adelaide.—Mean temp. of air 1°·7, and rainfall ·25 in., above the average of 42 years.
C. TODD, F.R.S.

Sydney.—Temp. 0°·7 above, humidity 9·6 below, and rainfall 3·44 in. below, their respective averages.
H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month, with N.W. and S.E. winds; strong wind from N.W. on 1st and 2nd; middle of month heavy R, 2·75 in. on 13th, then fine till end of the month when it was showery, with light, variable wind or calm, and warm nights. Temp. 1°·3 below, and rainfall 1·04 in. above, their respective averages.
R. B. GORE.

Auckland.—Fine and dry during the early part and middle of the month. Heavy N.E. gale from 23rd to 28th, with heavy rain on 27th and 28th. Mean temp. and rainfall slightly under the average of 32 years.
T. F. CHEESEMAN.

TRINIDAD.—Rain ·87 in. below the average of 30 years.
J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	·60	XI.	Builth, Abergwesyn Vic.	2·38
II.	Dorking, Abinger Hall .	·88	,,	Rhayader, Nantgwillt ...	2·59
,,	Birchington, Thor	·81	,,	Lake Vyrnwy	...
,,	Hailsham	·71	,,	Corwen, Rhug	1·74
,,	Ryde, Thornbrough	·55	,,	Criccieth, Talarvor	1·09
,,	Emsworth, Redlands ...	·97	,,	I. of Anglesey, Lligwy..	·92
,,	Alton, Ashdell	1·52	,,	I. of Man, Douglas	1·31
III.	Oxford, Magdalen Coll..	2·02	XII.	Stoneykirk, Ardwell Ho.	1·85
,,	Banbury, Bloxham	·82	,,	New Galloway, Glenlee	1·16
,,	Northampton, Sedgebrook	2·11	,,	Monaive, Maxwelton Ho.	3·14
,,	Stamford, Duddington..	·84	,,	Lilliesleaf, Riddell	1·13
,,	Alconbury	1·62	XIII.	N. Esk Res. [Penicuick]	·95
,,	Wisbech, Bank House...	1·15	XIV.	Glasgow, Queen's Park..	1·38
IV.	Southend	·78	XV.	Inverary, Newtown	2·25
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	2·91
,,	Colchester, Lexden	·34	,,	Islay, Gruinart School ...	1·41
,,	Rendlesham Hall	·02	XVI.	Dollar.....	1·50
,,	Scole Rectory	1·09	,,	Balquhidder, Stronvar...	2·08
,,	Swaffham	2·03	,,	Coupar Angus Station...	·57
V.	Salisbury, Alderbury ...	1·84	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	1·38	XVII.	Keith H.R.S.....	2·07
,,	Blandford, Whatcombe .	1·32	,,	Forres H.R.S.	1·59
,,	Ashburton, Holne Vic...	2·27	XVIII.	Fearn, Lower Pitkerrie..	·44
,,	Okehampton, Oaklands.	1·78	,,	S. Uist, Askernish	2·02
,,	Hartland Abbey	2·81	,,	Invergarry.....	·15
,,	Lynton, Glenthorne ...	2·65	,,	Aviemore H.R.S.	·78
,,	Probus, Lamellyn	1·59	,,	Loch Ness, Drumnadrochit	1·02
,,	Wellington, The Avenue	1·93	XIX.	Inversbin	·80
,,	North Cadbury Rectory	1·32	,,	Durness	3·11
VI.	Clifton, Pembroke Road	1·44	,,	Watten H.R.S.....	1·16
,,	Ross, The Graig	1·06	XX.	Dunmanway, Coolkelure	2·41
,,	Wem, Clive Vicarage ...	1·08	,,	Cork, Wellesley Terrace	2·01
,,	Wolverhampton, Tettenhall	1·46	,,	Killarney, Woodlawn ..	2·33
,,	Cheadle, The Heath Ho.	1·39	,,	Caher, Duneske	1·61
,,	Coventry, Priory Row...	1·17	,,	Ballingarry, Hazelfort...	3·77
VII.	Grantham, Stainby	·99	,,	Limerick, Kilcornan ...	1·10
,,	Horncastle, Bucknall ...	·59	,,	Miltown Malbay	5·04
,,	Worksop, Hodsck Priory	·85	XXI.	Gorey, Courtown House	2·02
VIII.	Neston, Hinderton	1·50	,,	Moynalty, Westland ...	...
,,	Southport, Hesketh Park	1·51	,,	Athlone, Twyford	2·52
,,	Chatburn, Middlewood.	2·34	,,	Mullingar, Belvedere ...	2·57
,,	Duddon Val., Seathwaite Vic.	2·81	XXII.	Woodlawn	2·96
IX.	Melmerby, Baldersby ...	1·44	,,	Crossmolina, Enniscoe ..	2·30
,,	Scarborough, Observat'y	1·45	,,	Collooney, Markree Obs.	2·92
,,	Middleton, Mickleton ...	1·21	,,	Ballinamore, Lawderdale	3·00
X.	Haltwhistle, Unthank H.	·50	XXIII.	Warrenpoint.....	1·65
,,	Bamburgh	·83	,,	Seaforde.....	1·60
,,	Keswick, The Bank.....	1·96	,,	Belfast, Springfield	1·84
XI.	Llanfrechfa Grange	1·76	,,	Bushmills, Dundarave..	2·26
,,	Llandovery	2·60	,,	Stewartstown	2·09
,,	Castle Malgwyn	1·37	,,	Killybegs	2·68
,,	Brecknock, The Barracks	1·07	,,	Horn Head	1·59

AUGUST, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·70	— 1·18	·49	31	6	91·2	15	48·6	21	0	
II.		Tenterden	1·09	— ·77	·38	31	8	86·0	15	48·0	21	0	
,,		Hartley Wintney	·68	...	·25	29	5	89·0	15	42·0	22	0	
III.		Hitchin	1·27	— ·55	·72	15	8	86·0	15	45·0	21	0	
,,		Winslow (Addington)	1·13	— ·84	·42	30	7	90·0	25	43·0	11*d*	0	
IV.		Bury St. Edmunds (Westley)	1·02	— 1·18	·51	15	7	77·0	15*c*	49·0	11	0	
,,		Norwich (Brundall)	·76	...	·25	15	7	84·0	15	46·0	11	0	
V.		Winterbourne Steepleton ...	2·67	...	1·32	29	7	82·0	24	42·4	22	0	
,,		Torquay (Cary Green)	3·26	...	1·32	7	9	77·2	19	52·6	22	0	
,,		Polapit Tamar [Launceston]..	1·35	— 1·13	·60	29	10	81·7	14	44·1	11*e*	0	
VI.		Stroud (Upfield)	·94	— 1·15	·39	29	9	86·0	3	54·0	31	0	
,,		ChurchStretton(Woolstaston)	1·26	— 1·50	·62	29	6	83·0	24	47·5	9	0	
,,		Worcester (Diglis Lock)	1·47	— ·50	·40	15	9	...	...	...	...	...	
VII.		Boston	·69	— 1·43	·15	28*a*	8	87·0	25	45·0	9, 11	0	
,,		Hesley Hall [Tickhill].....	·94	— 1·22	·28	31	9	89·0	25	43·0	11	0	
,,		Breadsall Priory	·64	...	·11	15*b*	9	86·0	25	46·0	9	0	
VIII.		Manchester(PlymouthGrove)	...	...	...	...	...	...	...	...	...	...	
IX.		Wetherby (Ribston Hall) ...	·95	— 1·39	·25	27	8	...	...	...	...	...	
,,		Skipton (Arncliffe)	1·40	— 2·93	·44	27	11	...	...	...	...	...	
,,		Hull (Pearson Park).	·68	— 1·96	·40	27	4	87·0	1	42·0	12	0	
X.		Newcastle (Town Moor)	·87	— 1·84	·25	28	9	...	...	...	...	...	
,,		Borrowdale (Seathwaite).....	3·94	— 4·51	1·44	29	14	...	...	...	...	...	
XI.	WALES.	Cardiff (Ely).....	1·44	— 2·17	·44	29	8	...	...	...	...	...	
,,		Haverfordwest	2·25	— ·67	·67	7	10	82·0	2	46·1	11	0	
,,		Aberystwith (Gogerddan) ...	3·26	...	1·25	6	6	88·0	24	42·0	10	0	
,,		Llandudno.....	2·44	+ ·08	·76	28	14	86·0	24	51·0	9	0	
XII.	SCOTLAND.	Cargen [Dumfries]	2·71	— ·28	·78	29	8	83·0	2, 25	45·0	9, 10	0	
XIII.		Edinburgh (Blacket Place)...	·55	...	·28	29	8	82·7	24	47·0	10	0	
XIV.		Colmonell	1·68	...	·60	6	11	88·0	1	39·0	8	0	
XV.		Tighnabruaich	2·18	...	·71	29	9	70·0	1, 2	46·0	8, 9	0	
,,		Mull (Quinish).....	1·86	— 2·29	·74	29	11	...	...	...	...	...	
XVI.		Loch Leven Sluices	1·30	— 1·64	·40	30	6	...	...	...	...	...	
,,		Dundee (Eastern Necropolis)	·55	— 2·02	·25	29	7	83·0	22	45·0	29	0	
XVII.		Braemar	1·30	— 2·03	·82	30	8	79·7	23	34·5	10	0	
,,		Aberdeen (Cranford)	·58	...	·19	29	7	85·0	1	35·0	9	0	
,,		Cawdor (Budgate)	·82	— 1·43	·27	30	9	...	...	...	...	...	
XVIII		Strathconan [Beauly]	1·21	— 2·09	·35	14	6	...	...	...	...	...	
,,		Glencarron Lodge.....	2·72	...	·83	16	12	80·8	24	42·0	9	0	
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	
,,		S. Ronaldshay (Roeberry) ...	2·09	— ·47	·55	30	8	69·0	22	43·0	18	0	
XX.	IRELAND.	Darrynane Abbey.....	2·68	...	1·05	24	13	...	...	...	...	...	
,,		Waterford (Brook Lodge) ...	...	...	...	...	...	...	...	...	...	...	
,,		Broadford (Hurdlestown) ...	2·14	...	·43	29	15	...	...	...	...	...	
XXI.		Carlow (Browne's Hill)	1·57	— 1·40	·29	27	11	...	...	...	...	...	
,,		Dublin (FitzWilliam Square)	3·78	+ 1·26	2·23	5	10	77·8	24	49·1	10	0	
XXII.		Ballinasloe	2·58	— ·60	·61	5	12	79·0	1	46·0	12	0	
,,		Clifden (Kylemore)	6·38	...	·96	26	11	...	...	...	...	..	
XXIII		Waringstown	1·60	— 1·51	·60	18	10	89·0	1	40·0	28*f*	0	
,,		Londonderry (Creggan Res.).	2·11	— 2·01	·42	29	14	...	...	...	...	...	
,,		Omagh (Edenfel)	3·32	— ·17	1·09	29	11	81·0	22	43·0	15	0	

+ Shows that the fall was above the average ; — that it was below it.

a—and 30. *b*—and 27, 31. *c*—and 25. *d*—and 22. *e*—and 12. *f*—and 29.

METEOROLOGICAL NOTES ON AUGUST, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Very dry and hot; splendid harvest weather. Six days with temp. over 80°, and only seven below 70°. Duration of sunshine 270 hours. Grass was much burnt up. TS on 5th; L on 15th and 31st.

HARTLEY WINTNEY.—The driest August known, and remarkable for extreme heat, cloudless days and starlight nights. The severity of the protracted drought was keenly felt; the period of 93 days from May 25th to August 27th yielded only 1·24 in. of R, or ·018 in. per diem. R 2·48 in. below the average. Sunshine was registered each day at 9 a.m. until the 29th. The temp. in shade at 9 a.m. on 24th and 25th was respectively 79°·2 and 80°·0. Distant T on 3 days, and L on 3rd, 4th and 5th. Ozone on 5 days. Swifts last seen on 11th.

WINSLOW, ADDINGTON.—Very hot and dry, with little R until 30th. There have been Augusts with less R than this, but they were all preceded by very wet Julys, notably in 1880, when the R in August was only ·84 in., but in July 8·24 in. On 15th there was a heavy TS, lasting over five hours, with vivid L but little R. During the TS on 30th the L entered the chimney of a house near Winslow, breaking its way through an iron stove-pipe into the room, but did no further damage.

BURY ST. EDMUNDS, WESTLEY.—Splendid month for the harvest. R below half the average. Ponds and wells getting very low. Many complaints of want of water. TS on 15th; distant T on 4 days.

NORWICH, BRUNDALL.—An exceedingly dry month, with an unusually large number of fine, bright and sunny days. The max. temp. was frequently considerably lower than further inland, owing to the prevalence of E. and N.E. winds. Severe TS on the evening of 15th; T and L on 28th and 30th.

WINTERBOURNE STEEPLETON.—A month of great heat, with a long absolute drought of 20 days, but good rains fell both at the beginning and the end. Mean daily temp. 62°·9, being the highest in any month since record commenced in 1893. A splendid harvest season, and the root crops, from the heavy R which fell at intervals, look well. T and L on 3rd; L on 6th.

TORQUAY, CARY GREEN.—Mean temp. 65°·9, or 4°·4 above, and R ·51 in. above, the average. Duration of sunshine 306 hours 25 mins., being 113 hours 35 mins. above the average. One sunless day.

POLAPIT TAMAR [LAUNCESTON].—A very dry month, in fact the driest August in 19 years. Exceptionally high shade temp. prevailed throughout, the mean max. being 75°·5. T on 5 days; L on 3 days.

STROUD, UPFIELD.—TSS on 3rd, 6th, 15th and 30th.

WOOLSTASTON.—Intensely hot and dry, the drought continuing till 28th. An excellent harvest well gathered in, but grass and root crops almost burnt up. Mean temp. 64°·1.

BOSTON.—Although the max. temp. was not so great as on some previous occasions, the mean temp. of this month was the highest recorded, being 5°·7 above the average. On 14 days the max. temp. in shade exceeded 80°.

BREADSALL PRIORY.—Exceptionally dry and hot. T on 15th.

ARNCLIFFE VICARAGE.—Unusually dry, with great heat.

WALES.

HAVERFORDWEST.—One of the finest Augusts and certainly the warmest during 50 years. The temp. exceeded 80° on each of the first three days, and was between 70° and 80° on 24 days. A special feature was the high night

temp., 4 nights having a temp. above 60°, 23 between 50° and 60°, and only 4 below 50°. From 9th to 24th absolute drought prevailed with cloudless skies. Vegetation has suffered severely, the grass lands being almost burnt up. Violent TS from 5.30 to 7 p.m. on 7th, flooding the lower parts of the town.

GOGERDDAN.—Very hot and dry throughout.

LLANDUDNO.—T and L on 4th, 5th and 31st.

SCOTLAND.

CARGEN [DUMFRIES].—The warmest August since observations commenced in 1860. Higher daily temp. was registered in 1868, 1869 and 1870, but the mean max. of 73°·0 in 1899 has never been exceeded. On only 11 days was the max. temp. below 70°. Upwards of half the R fell on the four days 27th to 30th. Easterly and southerly winds prevailed, always light. Harvest operations commenced in the middle of the month under most favourable conditions.

EDINBURGH, BLACKET PLACE.—R the same as in 1880, the only smaller fall in August being ·45 in. in 1796. Partial drought for 35 days ended on 28th. Mean temp. 61°·5, which has been exceeded in only five Augusts since 1764. The air was very calm throughout. TS with no R on 25th. Fog on 14th and 23rd.

COLMONELL.—R 2·44 in. below, and mean temp. 62°·2, or 4°·2 above, the average of 23 years, the mean temp. being the highest in that period and equal to that of 1893. T on 4 days. L on 25th.

TIGHNABRUAICH.—A model summer month.

BRAEMAR.—T and L from 6 to 8 p.m. on 25th; a house struck. T and L at 8 p.m. on 30th.

ABERDEEN, CRANFORD.—Very warm and dry, the temp. on some nights varying from 60° to 68°. A heavy W.N.W. gale from 4 p.m. on 16th till 2 a.m. on 17th, destroyed garden plants and stripped trees of foliage. The tents filled with exhibits at the Horticultural Exhibition were blown down.

S. RONALDSHAY, ROEBERRY.—A very fine month, but with a great deal of fog. Mean temp. 56°·0, or 1°·7 above the average of 9 years. Mean max. 61°·0, min. 51°·0.

IRELAND.

DARRYNANE ABBEY.—The first three weeks very hot and dry, and the last ten days cooler and showery.

BROADFORD, HURDLESTOWN.—R 2·08 in., and rainy days 6, below the average of 14 years, and the smallest on record. Want of R was much felt in many places, but not here. Crops of all kinds very good. L on 3rd. S.E. gale on 26th.

DUBLIN, FITZWILLIAM SQUARE.—The hottest August for many years. Mean temp. 63°·4, or 3°·7 above the average, and 0°·4 above that of August, 1893, the record hitherto. Mean temp. reached 70° on 18 days. It was a month of paradoxes—the R was much in excess, rainy days much in defect; the weather was dry, the air was damp; E. and W. winds were the most prevalent. High winds on 9 days, but never reaching the force of a gale. T on 4 days, and L on 4 days. Violent TSS on 4th, 5th and 6th, the R accompanying that on 5th being 2·23 in. Fog on 7 days. Solar parhelia were seen on 24th.

BALLINASLOE.—TSS on 4th and 6th.

CLIFDEN, KYLEMORE HOUSE.—TS on 5th.

OMAGH, EDENFEL.—The magnificent spell of summer weather which commenced on July 25th and lasted till August 24th with but four rainy days, was finally followed by a week's copious R, bringing the month's total close to the average. It is many years since so abundant a harvest of all crops was so well secured.

No. CCCCV.]
VOL. XXXIV.

[PRICE FOURPENCE.
Or 5s. per annum post free.

SYMONS'S
MONTHLY
METEOROLOGICAL
MAGAZINE.

THE NEW YO
PUBLIC LIBR
ASTOR, LENO
TILDEN FOUNDATI

CONTENTS.

	PAGE
Meteorological Extremes.—II., Temperature	129
The Moon in relation to Air Temperature	135
Trees and Change of Temperature	137
Meteorological Notes at Tai-Yuen-Fu, Shansi, North China	138
Results of Meteorological Observations at Camden Square during September for 40 Years, 1858–97	139
Climatological Table for the British Empire, April, 1899	140
Supplementary Table of Rainfall, September, 1899	141
Rainfall and Temperature in September, 1899, at 50 Stations	142
Meteorological Notes on September, 1899	143
Heavy Rainfall on October 1st	144

OCTOBER, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

BRITISH RAINFALL.

Subscriptions of £1 or upwards received between September 11th and October 11th :—

	£	s.	d.
Balfour, D., Esq., C.B. ...	1	0	0
Bankes, Mrs. Scott ...	1	0	0
Brodie, C. G., Esq. ...	1	1	0
Bute, The Marquess of ...	5	5	0
Cropper, J., Esq.	1	0	0
Crossman, Gen. Sir W. (2 years)	2	2	0
Dees, R. R., Esq.	1	5	0
Eadaile, C. E. J., Esq. ...	1	1	0
Farrah, J., Esq.	1	1	0
Fleming, T. R., Esq. ...	1	0	0
Hamersley, Mrs.	1	0	0
Haworth, H. S., Esq. ...	1	0	0
Hayle, Dr.	1	1	0
Hazen, Prof. H. A. ...	2	0	0
Hervey, M. W., Esq., C.B.	1	1	0
I'Anson, Dr. ...	1	0	0
Jones, W. H., Esq. ...	1	1	0
Latham, T., Esq. ...	1	0	0
Oliver, T., Esq.	2	2	0
Phillips, J. Capel, Esq. (2 years)	2	2	0
Shaw, A. W., Esq. ...	1	0	0
Silver, S. W., Esq. ...	1	1	0
Somerset, His Grace the Duke of	1	0	0
Southwell, H. J., Esq. ...	1	1	0
Stewart, Mrs. Herbert ...	1	0	0
Waddingham, T. J., Esq. ...	1	1	0

THE OBSERVATORY;

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and [illegible] Meteorological Societies, and of the British Astronomical Association. Articles by various eminent Astronomers, English, American, and Continental. Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the guidance and direction of observers.

The Observatory was founded in 1877, and has become an established and very valuable publication.—Prof. Young, in "Ten Years' progress in Astronomy."

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 6/

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCV.] OCTOBER, 1899. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE NEW PUBLIC LI

METEOROLOGICAL EXTREMES.—II.

WE are rather surprised that no criticisms on the first of these papers have reached us—we also regret it, because we cannot believe that our list was perfect, and we relied upon our readers to correct us and make it so.

TEMPERATURE.

Difficult as it was to obtain comparable and accurate data as to barometric pressure, it is much more so to obtain trustworthy data as to temperature. Six's thermometer was not invented till the end of last century, and it is overstating the case rather than the reverse, to put the *general* use, throughout the world, of maximum and minimum thermometers much earlier than 1850; and, without registering thermometers the recorded extremes can be regarded only as approximations. Moreover, the positions in which thermometers were placed differed greatly. The Glaisher pattern thermometer stand dates only from 1840, the Lawson from 1845, the Stevenson only from June, 1864. The Montsouris, as its name implies, cannot have been introduced before that observatory was founded, which was about 1871. And even now, in 1899, no uniformity of exposure in different countries exists, and there are few comparative series enabling strict comparisons to be made. We shall not consciously quote any inaccurate or doubtful figures, but as in all cases we indicate whence the statements are derived, we can be held responsible only for their correct reprinting.

We have found that so much repetition and alteration of the wording of the various writers would be required to bring the statements into perfectly systematic arrangement, that we have thought it best to leave them all *verbatim*; but, *roughly*, statements as to high temperatures come first, and low ones follow. Also, as far as possible, records from neighbouring countries are put together.

DR. BUCHAN'S ISOTHERMS.

The plate devoted to yearly mean temperature prepared by Dr. Buchan, F.R.S., and published in one of the "Challenger" volumes, gives no yearly isotherm higher than 85°, of these there are three,

the largest covering a large portion of Central Africa bounded on the N. by latitude 18° N., turning S.E.-wards near Suakin, including Massowah and Mocha but not Aden, and then running S.S.W. to about 150 miles S. of the Victoria Nyanza. This map therefore gives no support to the extreme temperature so often mentioned at the Southern end of the Persian Gulf; and on the monthly maps for the hot months also we fail to trace it. Dr. Buchan also gives two small areas of 85° one in Central India about Lat. 15° N., and the other in the Northern portion of South Australia in about Lat. 15° S. and Lon. 130° E.

As regards cold, Dr. Buchan assigns the lowest yearly mean temperature to an area surrounding the N. pole, but for the winter months he shows that far lower temperatures occur in Lat. 65° N. and Lon. 132° E., to which, for January, he assigns the frightful mean temperature of —60° F., *i.e.* 92° below freezing point, and 21° below the temperature of frozen mercury.

Extremes of Temperature.

The absolute range of the Northern Hemisphere, and doubtless of the world, is 217°·8, depending on the absolute maximum of 127°·4 at Ouargla, Algeria, July 17th, 1879, and the absolute minimum of —90°·4 at Werchojansk, on the Jana river, Siberia, lat. 67° 34′ N., long. 133° 51′ E, January 15th, 1885. It was once questioned if the human body could undergo, unharmed, such enormous temperature changes, and the question is now answered in the affirmative, although probably no person has ever experienced the entire range. The author, however, has closely approximated it, having experienced at Fort Conger, February, 1882, the very low temperature of —66°·2, and on the Maricopa Desert, Arizona, August 28th, 1877, he saw the temperature of the air at 114°, while the metal of his Aneroid barometer, beside him as he rode, assumed a steady temperature of 144°.—*American Weather*, by Gen. Greely, p. 121.

The Hottest Spot on Earth.

The hottest region on the earth is on the south-western coast of Persia, where Persia borders the gulf of the same name. For 40 consecutive days, in the months of July and August, the thermometer has been known not to fall lower than 100°, night or day, and often to run up as high as 128° in the afternoon. At Bahrin, in the centre of the torrid part of the torrid belt, as if it were Nature's intention to make the region as unbearable as possible, no water can be obtained from digging wells 100, 200 or even 500 ft. deep, yet a comparatively numerous population contrive to live there, thanks to copious springs which break forth from the bottom of the gulf, more than a mile from shore, The water from these springs is obtained by divers, who dive to the bottom and fill goatskin bags with the cooling liquid and sell it for a living. The source of these submarine fountains is thought to be in the green hill of Osman, about 500 or 600 miles away.—*Boston Herald*, 1890.

Heat in Western Asia.

The heat probably reaches its maximum in the low-lying coast district of the Tehama on the Red Sea, and along the west coast of the Persian Gulf. From the bare rocky walls skirting both sides of these land-locked basins the sunbeams are reflected with redoubled strength on the glowing waters, thus producing an enormous evaporation, which converts the surrounding atmosphere into a vapour bath. For Europeans a trip across the Persian Gulf is considered at these times extremely perilous, and the unhealthy climate of the Tehama has become proverbial.—*Stanford's Asia*, p. 127.

A Temperature of 122° at Night.

Advices from the Red Sea continue to describe the discomforts experienced at Suakin as very serious. The English soldiers it is said are "a pitiful sight," not one man is in fairly healthy condition; while even the Indian troops are grumbling bitterly and almost mutinous. The heat is tremendous, the frequent sandstorms are most distressing, and the deaths very numerous.

But if Suakin is bad, Massowah, which the Italians have occupied, is worse. A private letter says:—We called in at Massowah, and had to anchor for the night; and a more frightful, horrible night I never spent, not a breath of air, and the thermometer 122° Fahr. This is no exaggeration; we were panting about the deck, the heat seemed to choke you: sleep was out of the question. Some negroes seemed to feel the heat more than Europeans, and were groaning fearfully, and pouring buckets of water over their heads, which, however, was of very little use, as the water was between 95° and 100° Fahr. Five Italian Officers have committed suicide, and no wonder! Aden, after Suakin and Massowah, is a perfect paradise.—*British Medical Journal*, 1885.

High Temperatures.

The highest temperature is met with near the level of the sea in the Circars, and in the Great Western Desert.

The thermometer is recorded to have stood in 1799 in the northern Circars, at midnight, at 108°, and at 8 a.m. at 112° F. A land wind had blown for a fortnight. In the Arabian desert the temperature of the night is remarkably sultry, (1) being generally 100°, rising towards morning, and during the day being much higher. In the "suffocating pandemonium" of the great salt lake of Bahr Assal, in lat. 11° 37′ 30″ N., and long. 42° 33′ 6″ E., 570 ft. below the sea level, Major Harris (2) found the thermometer at 126° F., though covered up, and this suffocating heat continued throughout the day of his encampment. The physical features of the locality explain most satisfactorily this extraordinary heat, for this "unventilated and diabolical hollow" is engulfed between lofty and rugged

(1) Fraser's Journey into Korassan; ch. 1. Climate of Omán.

(2) Highlands of Ethiopia, vol. I.

mountains, being reached by a narrow defile. The station immed iately adjoining is 1,700 ft. above the level of the sea, and consequently 2,270 ft. higher than the lake. It has been observed (3) that in Lower Egypt, during the hot season, the thermometer in the shade ranges at noon from 90° to 100°; in Upper Egypt, from 100° to 110°; in Nubia, from 110° to 120°, and even, though rarely, to 130°; exposed to sand and sun it has risen even to 150° in the latter country. Near the Euphrates, in the desert, Griffiths (4) observed the heat during the land winds amount to 132° in shade, and even 156° in the sun. Buckingham (5) records having seen the thermometer in the shade at 126° two hours after noon; and Burckhardt (6) at 117°·5 at Esné, in Upper Egypt.

Thomson's *Introduction to Meteorology*, p 55.

Indian Stations with Shade Maxima exceeding 120° F.

F.	Year.	Station.	Lat.	Lon.	Altitude.
			° ′	° ′	feet.
120·3	1878	Agra	27 10 N.	78 5 E.	555
120·3	1879	Lahore	31 34 ,,	74 20 ,,	732
120·9	1882	Jacobabad	28 24 ,,	68 18 ,,	186
121·0	1886	Hyderabad	25 25 ,,	68 27 ,,	94
121·3	1877	Sialkote	32 29 ,,	74 35 ,,	830
121·5	1882	Dera Ishmail Khan	32 0 ,,	71 5 ,,	573

Blanford's *Climates and Weather of India.*

[It will be seen that all these stations are in the N.W. of India, most of them in the Punjab.]

Temperature in Kutchee.

At Bhag (Lat. 29° N.; Lon. 68° E.; Altitude 650 ft.) the Max. temp. in May, 1859, was 126°·0. [The difference between the dry and wet bulb averaged 23°·7 and often reached 35°].

Dr. Cook in *Quar. Jour. Met. Soc.*, Vol. ix. (1883) p. 137.

Heat in Australia.

Melbourne.—The highest temperature on record for Melbourne is 111°·2, in January, 1862; in 1876 it reached 110°·7, and 110°·5 on January 19th, 1882.—P. Barachi.

Sydney.—The highest temperature on record for Sydney is 108°·5, on January 13th, 1896; previous to that, the highest (since 1859) was 106°·9, in January, 1863.

H. C. Russell, F.R.S., in *Met. Mag.*, March, 1896.

Adelaide.—The highest shade temperature during 39 years ending December 31st, 1896, was 116°·3 on January 26th, 1858.

---

(3) Lane's Englishwoman in Egypt, let. VI.
(4) Travels in Arabia, p. 384.
(5) Travels in Mesopotamia.
(6) Travels.

Shade temperature in 1896.

Station.	January.												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	°	°	°	°	°	°	°	°	°	°	°	°	°
Wilcannia...	100	93	98	—	113	116	111	110	112	109	—	111	115
Gundabooka	112	107	112	114	118	121	123	118	118	115	114	124	117
	14	15	16	17	18	19	20	21	22	23	24	25	
	°	°	°	°	°	°	°	°	°	°	°	°	
Wilcannia...	98	104	120	111	—	99	115	117	114	—	116	—	
Gundabooka	121	120	128	128	124	129	126	120	126	129	119	98	

A telegram in the South Australia papers on January 28th, 1896, from Wilcannia, says, "Reports from White Cliffs state that last week the record went as high as 125° in the shade by day, and 110° on one occasion in the middle of the night. Rabbits have succumbed by thousands from the heat. No feed anywhere, and stock cannot subsist beyond a month."

Wilcannia is in 31° 31′ S. and 143° 23′ E., on the Darling river, about 600 miles W. of Sydney ; Gundabooka is also on the Darling, but further N.E., at its junction with the Warrego, in about 30° S., and 146° E.

The thermometer at Mildura, in the extreme north-west of Victoria, reached 120° F. on the 23rd of January, 1896, being the highest ever officially registered in any part of Victoria by properly tested instruments.—P. Barachi.

Meteorological Observations, Adelaide, 1896, by Sir C. Todd, K.C.M.G.

Extreme Temperatures in Australia.

The following, given in Dr. Hann's *Klimatologie*, 1897, are additions to the foregoing :—

	Lat.		Lon.		Altitude. feet.	Max. Temp.
Fort Bourke	30°	3′ S.	145°	48′ E.	361	121·5
Euston	34	34 ,,	142	24	—	124·5
Wolgett	30	6 ,,	148	12	525	123·8 (Dec., 1876.)

and Dr. Hann adds that Sturt, on his explorations on January 21st, 1845, reported the temperature as 131°.

Surface Temperature of the Soil.

It is no uncommon thing in dry and light (*i.e.*, badly conducting) soils, in hot climates, to find a superficial temperature of 120°, 140° F, and even more. We have ourselves observed it at 159° at the Cape of Good Hope. In the arid regions of Australia, Captain Sturt reports that a lucifer match dropped on the ground takes fire.

Herschel's *Meteorology* (1862), p. 41.

Intensity of Frost in the Arctic Regions.

Place.	Lat.	Lon.	Min.	Date.
	° ′	° ′	°	
Fort Simpson	62 7 N	121 33 W	−50·2	1851 Jan.
„ Constance	66 40	119 0 W	−59·4	1848 Dec.
„ „	„	„	−51·0	1849 Jan.
„ „	„	„	−56·0	„ Feb.
„ „	„	„	−72·0	1851 Jan.
„ „	„	„	−58·0	„ Feb.
Cambridge Bay	69 3 N	105 12 W	−52·5	1853 Jan.
„ „	„	„	−50·2	„ March
Victoria Harbour, Boothia Felix	70 8 N	91 35 W	−56·5	1831 Jan.
Camden Bay	„	145 29 W	−51·0	1853 Dec.
„ „	„	„	−51·0	1854 Feb.
Princess Royal Island	72 47 N	117 35 W	−51·0	1851 Jan.
„ „ „	„	„	−51·0	„ Feb.
„ „ „	„	„	−51·0	„ March
Port Leopold	73 50 N	90 12 W	−52·0	1849 Feb.
Mercy Bay	74 6 N	117 55 W	−51·0	1851 Jan.
„ „	„	„	−51·0	„ Feb.
„ „	„	„	−51·0	„ March
„ „	„	„	−51·0	1852 Jan.
„ „	„	„	−65·0	1853 „ *
„ „	„	„	−57·0	„ Feb.
„ „	„	„	−58·0	„ March
„ „	74 42 N	101 22 W	−52·0	1854 Jan.
Melville Sound	„	„	−53·0	„ Feb.
Beechey Island	74 43 N	91 54 W	−53·0	1853 Jan.
Dealy Island	74 56	108 49 W	−61·0	„ „
Wolstenholm Sound	76 34 N	68 45 W	−54·0	1850 Feb.
„ „	„	„	−51·0	„ March
Northumberland Sound	76 52 N	97 0 W	−57·0	1853 Jan.
„ „	„	„	−51·0	„ March
Van Rensselaer Harbour	78 37 N	70 53 W	−58·3	1854 Jan.
„ „ „	„	„	−66·4	„ Feb.
„ „ „	„	„	−54·2	„ March
„ „ „	„	„	−59·9	„ Dec.
„ „ „	„	„	−65·5	1855 Jan.
Franz Josef Land	79 51 N	59 0 E	−51·0	1873 Feb.
„ „ „	„	„	−50·6	1874 Jan.
„ „ „	„	„	−51·0	„ March
Discovery Harbour	81 44 N	65 0 W	−54·0	1875 Dec.
„ „	„	„	−63·0	1876 Jan.
„ „	„	„	−62·0	„ Feb.
„ „	„	„	−70·8	„ March
Fort Conger	„	64 45 W	−52·2	1881 Dec.
„ „	„	„	−58·2	1882 Jan.
„ „	„	„	−62·1	„ Feb.
„ „	„	„	−50·6	1883 Jan.
„ „	„	„	−56·5	„ Feb.
Floeberg Beach	82 27 N	61 22 W	−59·2	1876 Jan.
„ „	„	„	−66·5	„ Feb.
„ „	„	„	−73·8	„ March

* "In January, 1853, the temperature fell lower than has ever been experienced by any former expedition, to 65° below zero, and in the interval of the usual period for taking the observations it fell to −67°, and the force of the wind likewise was greater. The mean temperature of the month was −43°·8, lower than we had known it during any former winter, and, I believe, surpassing in degree anything recorded in former Polar voyages. January 6th was the coldest day that has ever been known in these latitudes; the mean temperature for twenty-four hours was 61°·6 below zero; and in the twenty-four subsequent hours −56°·7, from which some idea may perhaps be formed of the intensity of the cold during this the coldest of the cold winter months."

We have compiled the preceding table from the excellent *Contributions to the knowledge of the Meteorology of the Arctic Regions*, prepared for the Meteorological Office by Mr. R. Strachan, and from General Greeley's *Three Years of Arctic Service*. The entries are of minima below —50°F., but it is not to be assumed that they are *all* the instances; they are mostly monthly minima, and evidently if on two days the temperature fell to —51° F., and on one to —53° the latter alone would be entered.

There is also the great uncertainty as to the correctness of the thermometers shadowing almost all the entries; but we are sure that both authors did all that was possible, and that therefore no better data can be obtained for byegone years. Science has progressed, and the old difficulties will exist no longer.

Frost in the U.S.A.

At Poplar River, Montana, North America, the thermometer fell to —63°·1 in January, 1885.

Meteorology, by Dr. J. W. Moore (1894), p. 310.

Intense Frost in Scotland.

On December 4th, 1879, intense frost prevailed in the S. of Scotland, —16° was reported from Kelso, and —23° from Blackadder in Berwickshire. This was the reading of a Six's thermometer on a post 2 ft. above ground, and with a board above to keep off rain. The thermometer agreed closely with one which had been verified at Kew.

The Frost of 1895 in Scotland.

In valleys where the chilled air can accumulate and lie stagnant, temperatures were recorded below zero Fahrenheit, the lowest being —17° at Braemar, and —11° at Drumlanrig.

R. C. Mossman, in *Jour. Scot. Met. Soc.*

London Extremes for 104 Years.

Somerset House, 93°·5 in July, 1808, and 4° in December, 1796.
R.O., Greenwich, 97°·1 in July, 1881, and 4° in January, 1841.
Camden Square, 94°·6 in July, 1881, and 6°·7 in December, 1860, and in January, 1867. *Met. Mag.*, March, 1899.

THE MOON IN RELATION TO AIR TEMPERATURE.

To the Editor of the Meteorological Magazine.

Sir,—I do not think that my position relative to the relation between the moon and our weather has been at all met by Mr. MacDowall on page 104 of the August issue. I still maintain, that there should be some possible reasoning by which such a relation may be premised, before pure coincidences can be regarded as of real value. It appears that Mr. MacDowall realizes this, for he suggests

that "a connection of the moon with temperature through barometric pressure is surely not very unthinkable." It seems to me that if Mr. MacDowall really advances this as a valid argument to support his contention, he has practically surrendered his position. The effect of the moon on pressure has been most carefully worked out, and has been found almost inappreciable; in fact, it has been found necessary to study records at St. Helena and other places where the atmosphere is but slightly disturbed, in order to get any effect at all. Now, are we to believe that a secondary effect on temperature from the moon through pressure is going to be appreciable when the direct effect on pressure is so slight; I trow not. It seems that such weak efforts to bolster up a doubtful theory, or at best a surmise, simply add weight to the crash which must come with its final downfall.

This matter reaches out much farther than appears at first sight. In a review of a paper by Hildebrandsson on page 106, it is remarked upon a comparison in which a supposed relation is presented between the spring rainfall in British Columbia and the autumn rainfall at the Azores, "The figures and diagram show an agreement between the records to which no word is so appropriate as marvellous."* This agreement is more marvellous than it seems at first sight. On looking up the Canadian records, there are none for any one station in British Columbia, and this probably accounts for the omission of the name of a station. If the B.C. record is made up from several independent stations and without a continuous series of observations, this supposed agreement is all the more remarkable, but does it not also serve to overthrow the alleged relationship? Fortunately, the United States has a continuous record from 1870 to the present time at Portland, Oregon, just across the border from British Columbia, and most persons will admit that a record there, ought to very fairly represent the rainfall in B.C. It should be stated that, in the original comparison by Dr. Hildebrandsson, a curve is drawn, showing the rainfall by years in the *spring* in B.C. from 1878 to 1890 (evidently by far too short an interval to prove anything), and this is compared with a similar curve at Ponta Delgada, in the Azores, for the *autumn* rainfall. A similar comparison between the rainfall at Portland, Oregon, and Ponta Delgada shows slight similarity between the curves (the curves are not reproduced). If there is anything that can be asserted positively about rainfall, it seems to be that, the conditions for rain on the middle Pacific coast are so dissimilar from those in the mid-Atlantic, that any apparent similarity in such curves must be set down at once and without hesitation as purely fortuitous. The cause of rain at any point may be regarded as extremely obscure, but surely it can

* If Prof. Hazen had quoted the whole sentence, instead of stopping at a comma, he would have seen that we did not accept the "marvellous agreement" as proof of interdependence.—Ed.

be said without fear of contradiction, that by no possibility can the forces operative in producing rain in British Columbia in spring, have a like influence in the rainfall nearly half-way around the world, and six months later.

Surely we may conclude that in attempting to prove relationship between dissimilar phenomena in meteorology the three rules already formulated should be observed.

(1) There must be enough data, at least 50 coincidences.

(2) It should be posssible to show by *a priori* reasoning, how such a relation can exist.

(3) The data used should be strictly homogeneous. Prof. Wild, of St. Petersburg, has well said: "Without exact and satisfactory (and we may add properly studied) data, meteorology cannot develop as a science, but will be, as heretofore, mainly a tumbling-ground for vague speculations and dilettante investigations."

H. A. HAZEN.

Box 216, Washington, D.C., Aug. 30th, 1899.

TREES AND CHANGE OF TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—I note on p. 114 of the September number a paragraph on "Trees and Change of Temperature" that has interested me very much. It is stated that "Observation does not, it is true, show that the mean temperature is lower than it was a century ago, but the disappearance of many plants which formerly flourished on this island and in Central Europe seems to indicate that such a change is in progress." I am aware that the original of this quotation was a newspaper article, and can be judged accordingly; but do you not give it too much authority, if not indeed endorse it, by this publication? [Surely not. We inserted it in order to elicit opinions and explanations.—ED.] If the temperature has not changed, and certainly that fact has been established, then we cannot ascribe the disappearance of the trees and plants to such change. I think that the records show no appreciable change in climate since historic times. Plants from the mummy cases of 4,000 years ago do not show much difference, if any, from those of the Nile valley at the present time. Whether the effect of temperature or rainfall is different because of the cutting away of forests, or whether the soil has changed in its properties because of continual plant growth, or the plants and trees themselves have run out (a not unusual occurrence), it may be impossible definitely to state; but surely we may say, without hesitation, that the climate or its changes have had nothing to do with this disappearance. Some have predicted the end of the world by a freezing to death of all life, still others by just the contrary effect, or by a burning up of every living thing; but there is no evidence of any permanent change. Some have thought that Greenland, at one time,

must have had a much milder climate, else how came it by its name. The early voyagers from the ice-bound rocks of Iceland would be charmed by the spring-time green of this land, noted even at this later day, and would readily give the name by which it is known. In the United States, we have had great stories from old-timers of the very remarkable winters they used to experience when they were boys, and of their very mild character at present, but all such stories were given a death-blow last winter by a storm and blizzard which exceeded anything in the memory of man. In the fair city of Washington, where a snow of six inches is rare, there were 34 inches on a level. The question of a change in climate is an intensely interesting one, and merits the most careful study, but there is no evidence of such change within historic times. Of course, it is admitted, without question, that there have been marked changes since glacial times, or within 40,000 years or so.

H. A. HAZEN.

September 25th, 1899.

METEOROLOGICAL NOTES AT TAI-YÜEN-FU, SHANSI, NORTH CHINA.

Lat. 37° 55′ N. Lon. 112° 52′ E.

	1896.				1897.				1898.			
	Average Max.	Average Min.	Mean.	Rain.	Average Max.	Average Min.	Mean.	Rain.	Average Max.	Average Min.	Mean.	Rain.
	°	°	°	in.	°	°	°	in.	°	°	°	in.
January ...	35	8	22	—	29	8	19	·25	34	11	23	·10
February ..	39	15	27	—	36	10	23	—	40	19	28	·68
March.....	47	23	35	—	48	29	38	·51	47	26	37	·42
April	64	42	53	2·73	66	41	54	·83	66	40	53	·79
May.....	75	50	62	1·81	76	53	64	·53	82	56	69	·46
June	87	63	75	2·21	88	62	75	1·67	86	61	73	·36
July.....	94	67	81	1·71	90	70	80	3·94	90	68	79	5·81
August ...	84	64	74	5·73	87	66	76	2·95	82	62	72	3·16
September	74	52	63	·36	77	54	65	·50	69	55	62	·84
October ..	61	39	50	·18	65	38	52	·40	63	40	52	·71
November.	51	29	40	—	46	29	37	·89	46	30	38	—
December .	31	10	20	·30	29	9	19	—	34	12	23	—
Means or Totals	62	38	50	15·03	61	39	50	12·47	62	40	51	13·33

Meteorological observations from the interior of China are always so difficult to obtain that we are much indebted to Mr. F. Jacomb Hood for sending us the abstract of observations by Mr. E. H. Edwards, M.B., C.M., which we have arranged in the above table.—ED.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

SEPTEMBER.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	·85	9	·32	0	60·1	57·0	85·0	70·7	44·0	53·5	..	..	..	..	6·1
1859..	4·04	18	1·66	1	57·1	54·1	76·6	66·6	41·6	49·6	..	..	..	..	5·9
1860..	2·92	14	·89	0	53·9	51·5	71·0	63·3	36·4	46·1	..	..	31·3	42·1	6·2
1861..	2·15	15	·49	0	56·9	53·9	82·0	71·9	36·0	47·3	..	..	29·0	42·9	5·7
1862..	2·19	13	·88	0	57·8	54·7	74·2	67·5	38·8	50·2	..	..	32·0	46·2	5·7
1863..	3·49	13	·63	0	54·2	51·1	71·8	63·7	33·8	45·6	..	..	27·7	41·3	5·8
1864..	2·55	12	·67	0	56·6	54·1	74·9	68·4	39·0	48·8	..	..	35·4	45·1	6·4
1865..	·55	4	·42	0	61·8	58·0	85·0	76·4	41·5	54·5	..	..	40·0	49·2	2·1
1866..	3·89	27	·47	0	56·4	54·7	74·0	65·5	39·0	50·1	..	..	28·5	41·9	7·0
1867..	2·23	11	·55	0	57·6	55·0	79·0	68·1	36·0	50·4	..	..	30·0	45·9	6·7
1868..	1·74	11	·33	0	60·0	56·3	91·0	71·8	43·0	50·0	..	..	42·6	48·8	5·8
1869..	3·56	14	·84	0	58·7	55·1	76·0	68·4	41·2	51·9	..	..	(30·2)	(45·9)	7·1
1870..	2·00	9	·41	0	55·1	52·8	74·0	67·7	37·6	47·6	119·7	104·6	36·2	43·2	5·1
1871..	5·28	13	1·22	1	57·2	53·9	81·0	67·8	38·1	50·6	122·0	102·6	37·4	49·2	5·5
1872..	1·64	13	·38	0	57·5	54·0	83·1	67·9	33·0	49·9	131·8	108·7	31·1	47·4	5·1
1873..	2·46	11	·93	0	54·0	51·3	72·0	64·9	40·3	46·3	120·0	105·9	35·7	41·8	4·9
1874..	2·62	15	·99	0	57·9	55·3	78·2	68·1	43·3	50·7	125·6	104·5	42·0	48·3	6·0
1875..	2·86	15	·77	0	59·9	57·3	80·8	70·8	44·2	52·3	123·0	107·0	40·2	49·1	4·8
1876..	2·86	22	·64	0	55·6	53·8	71·4	65·5	41·3	49·4	120·2	101·2	38·0	45·6	6·3
1877..	·82	10	·28	0	53·2	50·3	73·3	63·7	36·1	46·2	119·5	102·1	31·3	41·7	6·0
1878..	·83	12	·20	0	56·4	54·1	75·4	66·7	37·7	49·1	120·2	103·3	34·9	45·8	4·7
1879..	3·67	12	1·49	1	56·0	53·4	72·6	65·6	39·6	49·5	120·7	101·2	35·8	46·2	6·0
1880..	4·04	12	1·33	2	59·2	56·7	88·3	69·7	42·1	52·8	129·8	107·1	38·2	48·5	5·7
1881..	2·03	11	·85	0	55·4	53·4	73·7	65·4	41·7	49·7	119·3	100·9	36·3	46·5	6·7
1882..	2·39	9	·86	0	54·8	52·3	70·6	64·7	37·8	47·3	125·2	99·7	34·7	42·8	6·0
1883..	3·83	18	·65	0	56·1	54·2	75·3	66·7	41·4	50·2	120·7	100·4	35·4	45·8	6·1
1884..	1·77	15	·57	0	59·6	56·4	81·5	68·8	40·6	52·3	116·6	99·6	33·6	46·7	5·6
1885..	4·30	19	1·48	1	55·0	52·3	76·5	64·8	33·7	48·4	116·3	97·7	27·7	43·0	5·6
1886..	1·73	11	·42	0	58·3	54·9	84·2	68·7	42·2	52·5	117·7	101·4	33·8	47·1	4·6
1887..	1·81	19	·35	0	54·2	51·1	69·5	62·8	34·3	47·9	118·6	99·4	31·4	43·8	6·2
1888..	1·43	14	·37	0	55·6	53·4	72·7	65·2	42·4	50·0	116·3	98·7	36·3	45·3	6·0
1889..	1·77	10	·73	0	55·4	52·4	80·3	65·6	35·1	48·9	125·6	99·3	28·4	44·6	5·6
1890..	·64	5	·26	0	58·7	56·0	75·9	70·1	37·8	51·3	119·9	104·0	37·1	48·0	4·8
1891..	1·03	15	·17	0	58·0	55·3	80·4	68·5	43·3	51·4	116·9	102·5	39·4	47·1	4·6
1892..	2·12	13	·94	0	56·3	53·0	73·6	65·7	36·4	49·0	118·4	101·4	28·0	43·6	5·1
1893..	1·07	10	·22	0	56·7	53·0	81·6	67·9	35·3	49·1	123·4	105·4	30·9	45·0	4·7
1894..	1·04	11	·27	0	54·0	51·6	71·2	63·0	36·7	48·0	113·6	93·6	31·6	43·1	6·7
1895..	1·28	2	1·24	1	59·6	57·0	82·8	73·7	42·6	51·5	121·3	108·0	33·5	45·1	2·8
1896..	5·51	22	·73	0	56·8	54·6	71·9	64·9	39·6	51·5	114·1	96·2	35·3	47·5	6·9
1897..	2·75	13	·68	0	55·4	52·5	70·6	64·0	38·1	48·5	115·0	100·6	34·0	44·4	6·5
Mean ...	2·39	13	·69	0·2	56·8	54·0	77·1	67·3	39·1	49·7	120·4	102·0	34·1	45·4	5·6
Ex- {	5·51	27	1·66	2	61·8	58·0	91·0	76·4	44·2	54·5	131·8	108·7	42·6	49·2	7·1
tremes {	·55	2	·17	0	53·2	50·3	69·5	62·8	33·0	45·6	113·6	93·6	27·7	41·3	2·1

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1899.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	65·6	1	32·1	12	55·9	41·3	40·1	76	106·4	27·1	2·64	20	6·8
Malta	77·0	16	48·4	3	67·8	54·8	52·2	77	136·6	42·5	·11	3	2·3
Cape of Good Hope	90·3	21	40·6	7	72·2	52·4	52·0	82	...	...	1·48	7	2·3
Mauritius	84·0	1	63·1	29	81·8	71·5	68·7	79	153·1	56·9	4·61	20	5·2
Calcutta	105·4	29	67·8	11	97·2	75·4	71·1	63	158·6	65·6	2·75	6	3·8
Bombay	92·2	17	74·7	22	88·6	77·8	73·1	72	141·3	66·9	1·57	4	2·2
Ceylon, Colombo	92·2	3*a*	73·2	2	89·5	76·3	75·0	83	151·5	71·5	6·66	19	5·7
Melbourne	84·1	1	40·0	27	69·3	51·3	50·9	75	137·0	33·9	2·52	9	5·5
Adelaide	90·9	21	45·8	26	74·0	55·6	49·0	59	142·9	37·3	2·07	9	4·9
Sydney	...	...	...	...	...	...	...	...	...	...	...	...	—
Wellington	73·0	2,3	38·9	28	65·1	52·8	49·5	71	125·0	33·0	3·61	13	4·2
Auckland	...	...	...	...	...	...	...	...	...	...	...	...	—
Trinidad	92·0	Sev.	64·0	4	89·2	67·8	65·7	65	165·0	59·0	·75	3	...
Grenada	85·0	11*b*	69·0	2	82·3	72·8	66·9	70	154·2	...	1·05	6	1·3
Toronto	78·4	30	21·3	4	53·5	36·0	37·6	72	93·0	17·2	1·62	14	5·3
New Brunswick, Fredericton	81·7	30	14·8	7	53·1	28·8	24·5	46	...	...	·37	3	3·6
Manitoba, Winnipeg	79·0	26	—12·8	2	48·4	25·1	...	81	...	...	2·17	8	5·3
British Columbia, Esquimalt	...	...	...	...	...	...	..	...	...	...	...	...	...

a—and 4, 28. *b*—and 15.

REMARKS.

MALTA.—Adopted mean temp. 60°·0, or 0°·4 above average. Mean hourly velocity of wind 12·0 miles, or 0·3 above average. Mean temp. of sea 63°·0. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·4 above, and rainfall ·84 in. below, their respective averages. Mean hourly velocity of wind 9·9 miles, or 0·8 below average; extremes, 26·2 on 18th and 1·8 on 25th; prevailing direction E.S.E. to E. by S. L on 23rd, and T on 25th. T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 82°·0, or 0°·5 below, of dew point 0°·7 above, and rainfall 4·81 in. below, their respective averages. Mean hourly velocity of wind 7·4 miles; prevailing direction S.W. T8S occurred on 8 days; L on 5 days. H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·7, and rainfall ·28 in., above the average of 42 years. A warm spell occurred between the 14th and 22nd, which is quite exceptional for this time of the year. C. TODD, F.R.S

Wellington.—Fine in the early part of the month, then showery, with intervals of very fine weather. Prevailing wind N.W.; generally moderate. Fog on 8th and 9th. Slight earthquake on 16th. Temp. 1°·9 above, and rainfall ·08 in. above, their respective averages. R. B. GORE.

TRINIDAD.—Rain 1·28 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·86	XI.	Builth, Abergwesyn Vic.	5·59
II.	Dorking, Abinger Hall .	2·93	,,	Rhayader, Nantgwillt ...	4·83
,,	Birchington, Thor	2·30	,,	Lake Vyrnwy	4·25
,,	Hailsham	4·46	,,	Corwen, Rhug	3·13
,,	Ryde, Thornbrough	2·34	,,	Criccieth, Talarvor	3·26
,,	Emsworth, Redlands ...	2·44	,,	I. of Anglesey, Lligwy..	3·85
,,	Alton, Ashdell	2·39	,,	I. of Man, Douglas	3·07
III.	Oxford, Magdalen Coll..	2·18	XII.	Stoneykirk, Ardwell Ho.	4·17
,,	Banbury, Bloxham	2·32	,,	New Galloway, Glenlee	5·73
,,	Northampton, Sedgebrook	4·73	,,	Moniaive, Maxwelton Ho.	3·16
,,	Stamford, Duddington..	...	,,	Lilliesleaf, Riddell	3·39
,,	Alconbury	3·59	XIII.	N. Esk Res. [Penicuick]	3·90
,,	Wisbech, Bank House...	4·66	XIV.	Glasgow, Queen's Park..	4·04
IV.	Southend	2·17	XV.	Inverary, Newtown	10·38
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	8·59
,,	Colchester, Lexden	2·31	,,	Islay, Gruinart School ...	2·27
,,	Rendlesham Hall	3·72	XVI.	Dollar.....	3·55
,,	Scole Rectory	2·81	,,	Balquhidder, Stronvar...	7·30
,,	Swaffham	4·95	,,	Coupar Angus Station...	4·19
V.	Salisbury, Alderbury ...	2·09	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	3·21	XVII.	Keith H.R.S.....	4·27
,,	Blandford, Whatcombe .	2·67	,,	Forres H.R.S.	3·33
,,	Ashburton, Holne Vic...	3·49	XVIII.	Fearn, Lower Pitkerrie..	...
,,	Okehampton, Oaklands.	4·04	,,	S. Uist, Askernish	6·75
,,	Hartland Abbey	3·36	,,	Invergarry.....	5·81
,,	Lynton, Glenthorne ...	4·58	,,	Aviemore H.R.S.	5·16
,,	Probus, Lamellyn	3·32	,,	Loch Ness, Drumnadrochit	4·65
,,	Wellington, The Avenue	1·49	XIX.	Invershin	5·33
,,	North Cadbury Rectory	3·18	,,	Durness.....	6·97
VI.	Clifton, Pembroke Road	3·79	,,	Watten H.R.S.....	5·09
,,	Ross, The Graig	2·34	XX.	Dunmanway, Coolkelure	2·22
,,	Wem, Clive Vicarage ...	2·74	,,	Cork, Wellesley Terrace	1·21
,,	Wolverhampton, Tettenhall	2·67	,,	Killarney, Woodlawn ..	3·16
,,	Cheadle, The Heath Ho.	4·14	,,	Caher, Duneske	2·08
,,	Coventry, Priory Row ..	4·64	,,	Ballingarry, Hazelfort...	2·19
VII.	Grantham, Stainby	3·82	,,	Limerick, Kilcornan ...	1·98
,,	Horncastle, Bucknall ...	2·58	,,	Miltown Malbay	4·47
,,	Worksop, Hodsck Priory	2·50	XXI.	Gorey, Courtown House	1·94
VIII.	Neston, Hinderton	3·45	,,	Moynalty, Westland ...	3·69
,,	Southport, Hesketh Park	3·87	,,	Athlone, Twyford	2·40
,,	Chatburn, Middlewood.	7·11	,,	Mullingar, Belvedere ...	3·04
,,	Duddon Val., Seathwaite Vic.	8·98	XXII.	Woodlawn	2·91
IX.	Melmerby, Baldersby ...	3·28	,,	Crossmolina, Enniscoe ..	4·66
,,	Scarborough, Observat'y	3·39	,,	Collooney, Markree Obs.	5·00
,,	Middleton, Mickleton ...	5·18	,,	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	4·13	XXIII.	Warrenpoint.....	3·41
,,	Bamburgh	2·73	,,	Seaforde.....	4·37
,,	Keswick, The Bank.....	6·80	,,	Belfast, Springfield	3·43
XI.	Llanfrechfa Grange	3·27	,,	Bushmills, Dundarave..	6·55
,,	Llandovery	3·14	,,	Stewartstown	3·29
,,	Castle Malgwyn	3·22	,,	Killybegs	7·77
,,	Brecknock, The Barracks	3·35	,,	Horn Head	4·93

SEPTEMBER, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32° In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·65	+ ·14	·95	29	14	88·1	5	36·4	29	0	
II.		Tenterden ...	2·39	— ·52	1·04	29	18	84·0	5	37·0	29	0	
,,		Hartley Wintney ...	1·91	...	·74	29	15	88·0	5	32·0	29	1	
III.		Hitchin ...	2·09	— ·41	·67	29	18	85·0	5	35·0	28	0	
,,		Winslow (Addington) ...	1·88	— ·79	·66	29	17	88·0	5	34·0	29	0	
IV.		Bury St. Edmunds (Westley)	2·48	— ·22	·82	29	15	79·0	5	33·0	29	0	
,,		Norwich (Brundall) ...	3·29	...	1·14	29	19	87·0	5	33·6	29	0	
V.		Winterbourne Steepleton ...	2·54	...	·81	30	14	77·3	5	34·4	29	0	
,,		Torquay (Cary Green)	2·57	...	·68	30	14	79·5	5	42·8	30	0	
,,		Polapit Tamar [Launceston]..	3·99	+ ·28	·67	30	20	82·4	5	39·8	30	0	
VI.		Stroud (Upfield) ...	1·47	— 1·44	·36	29	16	79·0	5	41·0	27	0	
,,		ChurchStretton(Woolstaston)	2·55	+ ·05	·68	29	21	80·5	5	41·0	28*b*	0	
,,		Worcester (Diglis Lock) ...	3·12	+ ·68	·97	6	17	...	...	...	...	...	
VII.		Boston ...	2·18	— ·59	·58	30	13	87·0	5	34·0	29	0	
,,		Hesley Hall [Tickhill]...	2·17	+ ·01	·56	29	17	81·0	5	31·0	29	1	
,,		Breadsall Priory ...	3·12	...	·87	29	15	82·0	5	33·0	29	0	
VIII.		Manchester(PlymouthGrove)	5·10	+ 1·63	·68	16	24	79·0	5	36·0	29	0	
IX.		Wetherby (Ribston Hall) ...	3·46	+ 1·00	1·25	21	16	...	...	...	...	...	
,,		Skipton (Arncliffe) ...	8·95	+ 4·19	1·65	29	18	...	...	...	...	...	
,,		Hull (Pearson Park).	2·55	+ ·11	·73	29	17	84·0	5	35·0	29	0	
X.		Newcastle (Town Moor) ...	2·60	— ·18	·74	29	16	...	...	...	...	...	
,,		Borrowdale (Seathwaite)...	14·02	+ 2·29	2·85	15	25	...	...	...	...	...	
XI.	WALES.	Cardiff (Ely)...	3·94	+ ·20	·77	1	19	...	...	...	...	...	
,,		Haverfordwest	1·99	— 2·41	·38	29	13	75·8	5	34·3	29	0	
,,		Aberystwith (Gogerddan) ...	4·20	— ·07	·86	27	16	80·0	5	32·0	28	1	
,,		Llandudno...	3·90	+ 1·68	·79	29	20	76·0	4	43·0	29	0	
XII.	SCOTLAND.	Cargen [Dumfries] ...	4·07	+ ·51	·52	15	15	79·0	6	34·0	28	0	
XIII.		Edinburgh (Blacket Place)...	3·78	...	1·38	30	23	69·1	4	37·2	28	0	
XIV.		Colmonell	6·30	...	1·75	26	25	77·0	7	30·0	14*c*	...	
XV.		Tighnabruaich	8·12	...	·93	15	25	64·0	1*a*	35·0	27	0	
,,		Mull (Quinish)...	6·90	+ 1·87	·79	15	28	...	...	...	...	...	
XVI.		Loch Leven Sluices ...	2·30	— ·49	·90	29	10	...	...	...	...	...	
,,		Dundee (Eastern Necropolis)	3·80	+ 1·29	1·75	30	18	73·0	11	35·6	28	0	
XVII.		Braemar	4·92	+ 2·06	1·91	30	25	65·2	11	32·6	29	0	1
,,		Aberdeen (Cranford)	3·62	...	·57	30	28	71·0	12	35·0	21*c*	0	
,,		Cawdor (Budgate) ...	4·72	+ 1·97	·49	22	26	...	...	...	...	...	
XVIII		Strathconan [Beauly] ...	8·30	+ 4·62	1·02	23	15	...	...	...	...	...	
,,		Glencarron Lodge...	14·92	...	2·00	26	30	66·0	4	34·5	29	0	
XIX.		Dunrobin ...	4·81	+ 2·22	·70	17	23	67·0	4	38·0	22	0	
,,		S. Ronaldshay (Roeberry) ...	5·14	+ 2·48	·54	10	30	67·0	4	40·0	18*d*	0	
XX.	IRELAND.	Darrynane Abbey...	2·40	...	·65	12	23	...	...	...	...	...	
,,		Waterford (Brook Lodge) ...	1·03	— 1·89	·25	21	12	74·5	5	34·0	29	0	
,,		Broadford (Hurdlestown) ...	2·93	...	·52	21	26	...	...	...	...	...	
XXI.		Carlow (Browne's Hill) ...	1·86	— ·96	·48	21	18	...	...	...	...	...	
,,		Dublin (FitzWilliam Square)	2·75	+ ·78	1·04	30	21	71·8	4	39·0	28	0	
XXII.		Ballinasloe	2·70	— ·09	·68	21	21	72·0	5	33·0	30	0	
,,		Clifden (Kylemore)	7·09	...	1·33	1	24	...	...	...	...	...	
XXIII		Waringstown ...	3·09	— ·07	·48	25	19	73·0	6	35·0	28*b*	0	
,,		Londonderry (Creggan Res.).	4·90	+ 1·12	·68	26	28	...	...	...	...	...	
,,		Omagh (Edenfel) ...	4·84	+ 1·46	·82	21	24	69·0	3	34·0	27		

+ Shows that the fall was above the average ; — that it was below it.

a—and 5, 6. *b*—and 29, 30. *c*—and 27. *d*—and 19.

METEOROLOGICAL NOTES ON SEPTEMBER, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The first week was very hot, and though there were slight showers after the middle of the month, the ground continued dry and parched till the rough and stormy weather set in at the end. L on 6th; T on seven days. Fog on 7th. Duration of sunshine 173 hours.

HARTLEY WINTNEY.—Continued heat and dryness still prevailed, and the great drought was not broken up till 19th, slight showers falling after that date until the end of the month. R only ·02 in. below the average. TS8 on 6th, 16th and 28th, and much L every night from 24th to 30th. Light S.W. winds prevailed till 16th, then more boisterous till the end. Ozone on fifteen days; mean 3·7.

WINSLOW, ADDINGTON.—Nice warm weather prevailed until quite the end. T and L on 2nd, and T on 6th and 28th. Vegetation touched by frost on 29th.

BURY ST. EDMUNDS, WESTLEY.—A normal September. The deep chalk wells were nearly dry at the close, and there were great complaints of want of water. The 5th was the hottest day of the year. TS on 6th; T on five days.

NORWICH, BRUNDALL.—Like last year the warmest day of the summer occurred in September. The latter part of the month was very unsettled. The heavy R of the 29th helped to make up the deficiency for the year, which was, at the end of the month, only 1·56 in., notwithstanding the dry summer. L on 2nd, 5th, 6th, 27th, 28th and 30th. T on 2nd, 6th and 27th.

WINTERBOURNE STEEPLETON.—The temp. kept up until the 18th, when a squally period set in, the mean for the fortnight ending 16th being 61°·0, and for the month 57°·1. Although R fell on 14 days, the fall was slight, except on 5th, 21st, 29th and 30th. T and L on 5th; T on 7th.

TORQUAY, CARY GREEN.—R ·22 in. above the average. Mean temp. 60°·5, or 2°·4 above the average. Duration of sunshine 185 hours 35 mins., being 22 hours 50 mins. above the average. No sunless days. Mean amount of ozone 5°·8.

POLAPIT TAMAR [LAUNCESTON].—The first fortnight was hot and comparatively dry, the latter very wet, and rather stormy, with considerably reduced temp. R ·67 in. above the average. Thick fog on three mornings. L on 6th; T on 7th; L and T on 29th.

WOOLSTASTON.—A seasonable month, with frequent showers. T on 6th. Mean temp. 55°·7.

BREADSALL PRIORY.—There were several hot days during the first week, but the latter half of the month was very cold for the time of year.

MANCHESTER, PLYMOUTH GROVE.—Very unsettled weather upon the whole. Fine in the first week. Mean temp. 51°·3. Very stormy, with T and L on 23rd.

WALES.

HAVERFORDWEST.—September, 1899, was in strong contrast to that of 1898. Up to the 15th it was fine, warm, and practically rainless, but after that the temp. fell, the weather became unsettled, and R fell on most days, while from the 26th to the end was very stormy. The harvest was unprecedentedly fine.

ABERYSTWITH, GOGERDDAN.—Stormy throughout, with strong winds from N.W. and S.W.

LLANDUDNO.—T and L on 23rd. T on 27th and 30th. H on 22nd.

SCOTLAND.

EDINBURGH, BLACKET PLACE.—Mean temp. and rainfall slightly above the average. The last week was stormy and unsettled. Heavy TS from 2.40 to 4 p.m. and L at night on 27th.

COLMONELL.—R 2·29 in., and mean temp. 0°·2, above the average of 23 years. T and L on 17th; T and very large H on 23rd.

TIGHNABRUAICH.—A bad harvest month; frequent strong winds from N., N.E. and E., with too much R. T and L on 17th.

ABERDEEN, CRANFORD.—A wet and cold month, with high winds and little sunshine.

S. RONALDSHAY, ROEBERRY.—A very wet and unsettled month, R falling every day. Mean temp. 50°·8, or 0°·9 below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—On the whole, a fairly fine month. The first three weeks were mild, the last ten days rather cold.

BROADFORD, HURDLESTOWN.—A cold and wet month. R ·20 in., and rainy days 8, above the average of 14 years. T at 3.30 p.m. on 27th.

DUBLIN, FITZWILLIAM SQUARE.—A month of sharp contrasts as regards temp. At first it was decidedly warm, afterwards it became still more decidedly cold. Unsettled and very squally, and showery, with blustering W. and N.W. winds almost constantly from 15th to 26th. Mean temp. 56°·2, being 0°·4 above the average. High winds on 13 days, reaching the force of a gale on 6. Fog on 3 days. TS on 30th; T and L on 29th; L on 5th.

OMAGH, EDENFEL.—The first ten days were reasonably fine and favourable for harvest purposes, but it is a long time since a more inclement period marked the month of September than that which prevailed from 10th to the end; strong winds, heavy R, and low temp. being persistent throughout.

HEAVY RAINFALL ON OCTOBER 1ST.

To the Editor of the Meteorological Magazine.

SIR,—On Monday last we recorded a torrential downpour, which fell on Sunday, October 1st, in a very short time, and I have since looked through our fifty years' record for falls of over 1·50 in.; they are as under, few and far between:—

	in.		in.		in.
1853. July 14	1·82	1875. July 3	2·06	1885. Sept. 10	1·56
1857. Oct. 23	3·09	1879. Aug. 2	1·94	1889. July 12	2·10
1865. Oct. 17	1·68	1880. Sept. 11	1·86	1890. July 17	1·88
1868. Aug. 19	2·22	1884. July 9	1·75	1899. Oct. 1	1·59
1874. July 10	1·62				

From 1890 to now is the longest interval without a heavy fall in late summer or early autumn.—Yours truly,

W. LUCAS.

The Firs, Hitchin, October 9th, 1899.

No. CCCCVI.]
VOL. XXXIV.

[PRICE FOURPENCE.
Or 5s. per annum post free.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
The British Association at Dover	145
Heavy Rainfalls, August and September, 1899	149
Meteorological Extremes.—II., Temperature	149
Smoke, Fog, and Maximum Temperature	149
Wonderful Story of a Thunderbolt	150
Definitions of Drought	151
A Compass Plant	151
Flood in Cape Town	152
A Wet Period, October and November, 1899	153
The Moon and the Weather	154
Results of Meteorological Observations at Camden Square during October for 40 Years, 1858–97	155
Climatological Table for the British Empire, May, 1899	156
Supplementary Table of Rainfall, October, 1899	157
Rainfall and Temperature in October, 1899, at 50 Stations ...	158
Meteorological Notes on October, 1899	159

NOVEMBER, 1899.

LONDON: EDWARD STANFORD,
26 & 27, COCKSPUR STREET, CHARING CROSS, S.W.

SHIELD, PRINTER, LANCHAM PLACE, BROMPTON ROAD, S.W.

BRITISH RAINFALL.

Subscriptions of £1 or upwards received between October 11th and November 11th :—

	£	s.	d.
Hastings, Corporation of...	1	1	0
Plymouth, Corporation of ...	1	1	0

	£	s.	d.
Burton, W. C. V., Esq. ...	1	0	0
Elmhirst, R., Esq.... ...	1	0	0
Rendlesham, Rt. Hon. Lord (2 years)	5	0	0
St. Benedict's Monastery ...	2	2	0
St. Maur, Lord Percy ...	1	10	0
Turner, H., Esq.	1	0	0
Waring, Holt, Esq... ...	1	0	0

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)

T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Ro Meteorological Societies, and of the British Astronomical Association ; Arti by various eminent Astronomers, English, American, and Continent Correspondence on topics of interest connected with the Science ; Notices Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assista and direction of observers.

The Observatory was founded in 1877, and has become an established and very valu publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observato Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 13

NOTICES.

It is requested that all Books for Review, and Communications t the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in t letters published in this Magazine rests with their respective authors.

METEOROLOGICAL MAGAZINE.

COMPLETION OF SETS.

Notice is hereby given that on and after December 31st nex numbers 201 to 360 will be withdrawn from individual sale, an can thereafter be obtained only in complete volumes. Number 36 is the last of Volume XXX.—the first series, to which an Index ha been published. Volume V. is out of print, and of several other

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCVI.] NOVEMBER, 1899. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

THE BRITISH ASSOCIATION AT DOVER.

THE pressure on our space compelled the omission of our usual notice last month, and necessitates considerable abridgement in the following note :—

There were five reports and nine papers distinctly meteorological or magnetical, and several of the papers read in the Geographical Section also bore upon the subject. We purpose giving the titles of all the strictly meteorological papers, and notes upon them where we are able.

Climatology of Africa.—Eighth report, prepared by the Chairman, Mr. E. G. RAVENSTEIN.

Meteorological returns have reached your Committee, in the course of last year, from forty stations in Africa.

Niger Territories.—One year's observations from Old Calabar have been received from Mr. E. G. Fenton, the medical officer. We regret that no information respecting the interior of the country has become available.

British Central Africa.—The scientific department, under the zealous direction of Mr. J. McClounie, is now in full working order, and full reports have been received for two stations of the second order, namely, Zomba on the highland, and Fort Johnston on the Lake Level, and also reports, more or less complete, from twenty-two other stations. Mr. McClounie hopes to be able, in the course of the present year, to equip two more stations of the second order, namely, Chinde on the coast, and another station on the lake. He has attempted to make two-hourly observations on term days, but as the exposure in the morning air resulted in fever, he has given up the attempt.

We have, in addition, received three years' registers for Lauderdale, from our most faithful correspondent, Mr. John W. Moir, as also fifteen months' record from Kambole, a station of the London Missionary Society, near the southern extremity of Tanganyika. The observer at the latter place is Dr. James F. Mackay.

British East Africa.—Returns from eight Government stations have been received. These returns are, of course, most welcome, and they speak well for the zeal of Mr. Cranfurd and the officers working under him ; but considering the practical importance of meteorological work, it is much to be desired that something should be done. Let us hope that the satisfactory working of a

"Scientific Department" in the South African Protectorate may induce the authorities to organise a similar institution for East Africa and Uganda. As a proof of the high value placed upon work of this kind in the neighbouring German Protectorate, we may state that a professional meteorologist has been appointed as inspector, and that there are now at work twenty-six stations, including two of the first, and seven of the second, order.

We are likewise in receipt of rainfall observations made by the Rev. R. M. Ormerod at Galbanti, on the Tana river.

The old Scottish Missionary Station at Kibwezi has been abandoned, and the missionaries have removed to a new station in Kikuyu, whence three months' observations have already been forwarded.

Uganda.—The valuable observations on the level of the Victoria Nyanza have been resumed since the suppression of the mutiny.

Mr. C. M. Hopley has forwarded two years' record of the rainfall at Mumia's, the headquarter station of Kavirondo.

Meteorological Observations on Ben Nevis.—Report drawn up by Dr. A. BUCHAN, F.R.S.

The hourly observations at the two observatories, *i.e.*, on Ben Nevis and at Fort William, have continued without any interruption. It is earnestly to be hoped that they will still continue, as there is no first-class observatory of which as much can be said. Want of funds seriously threatened the service two years ago, and it is only by private munificence that Mr. Angus Rankin and his assistants and volunteers, are enabled to carry on the work. The mean barometric difference between the two stations is 4·552 in.; it varies very little. The absolute extremes of temperature are remarkable. On September 6th, 79°·7 was registered at Fort William and 62°·6 on Ben Nevis; this was very late in the season, and occurred during anticyclonic weather. The greatest cold at Fort William (21°·1) occurred on November 29th; on Ben Nevis the extreme was 9°·6, on February 20th. Once, on December 8th, the dew point fell below zero, to — 6°·5. The mountain got 17 per cent. of the possible sunshine, Fort William 36 per cent. The mean hourly wind velocity on the top was 14 miles, the maximum being 27 miles in October, and the minimum 6 miles in July, the lowest value ever recorded. The rainfall, 240·05 in., also beats all records; December alone had 43·65 in., but the heaviest, almost tropical fall of 5·39 in. was on November 2nd. Fort William was, with 106·5 in. of rain, only 38 per cent. above average, whilst Ben Nevis exceeded the average by 59 per cent. Aurora was observed on thirteen nights; St. Elmo's fire on seventeen; of thunderstorms there are only four records; solar halos were seen on nineteen days, and lunar halos on five.

Meteorological Photography.—Report drawn up by Mr. A. W. CLAYDEN, M.A.

This Committee is practically a one-man Committee, and as Mr. A. W. Clayden has been unable to give so much attention to the work as in former years, there was only a short report. Some rare types of clouds and narrow ribbon streaks of lightning have been photographed. A narrow flash, seen at Exeter on July 22nd, lasted almost two seconds and broke up into sparks; it was not photographed, but well observed, and would explain the beads of bright light, noticed on certain photographs. Lightning seems frequently to

occur under the following conditions :—A lower cumulus cloud disc spreads out again from the middle to a higher cirriform disc. Discharges begin to play between the margins of the two discs, and then follows a discharge between the lower disc and the earth, corresponding to Lodge's impulsive discharge ; these discharges go together with heavy rains, and may have something to do with the dissociation of water.

Seismological Committee.—Report drawn up by Prof. MILNE, F.R.S.

The Report stated that as the British Association was now receiving co-operation from a number of observatories in foreign countries it was desirable that a central seismological laboratory should be established, at which earth movements could be recorded and analysed in relation to the corresponding registers received from abroad.

At Prof. Milne's station in the Isle of Wight, notwithstanding serious difficulties arising from the darkness and dampness of the room in which the instruments were placed, he had succeeded during the past year in recording 103 earthquakes. Over 70 per cent. of the Isle of Wight records are repeated in the register from Kew ; 58 to 65 per cent. of them were common to Nicolaiew, Potsdam, and Trieste ; and 56 per cent. to Victoria in British Columbia. From the times at which disturbances reached these and other observatories it had been possible to locate the centres from which they had originated. In many instances these were shewn to be sub-oceanic, and whilst they give evidence of geological activity on ocean beds they promise to indicate localities which it would be unwise to cross with telegraph cables.

A curious feature occasionally exhibited in a collection of seismograms referring to the same earthquake is that the large waves may be less in amplitude at a station near their origin, than they are at stations more remote. For example, an earthquake originating in Japan, crossing beneath the Pacific to Victoria, B.C., may yield a smaller diagram at that place than the one obtained in the Isle of Wight at double the distance. In this latter case the large waves swept over the free surface of two continents. The inference is that oceans exert a damping influence upon undulations of their beds. This possibly explains why seismograms from Mauritius show small amplitude.

The large waves, which appear to be surface waves, travel with a velocity that is practically constant. The preliminary tremors, however, although they out-race the large waves at a constant rate near to an origin, have an average velocity practically proportionate to the square root of the average depth of the chord joining the earthquake centrum and the distant station. Taking this observation as the foundation for the assumption that the square of the speed is a linear function of the depth, Dr. C. G. Knott arrives at the result that the square of the speed increases 0·9 per cent. per mile of descent. Assuming that the waves are compressional, and that the density of the earth increases uniformly towards its centre, then the co-efficient of its elasticity increases at a rate of nearly 1·2 per cent. per mile of descent.

One of the last sections in the Report referred to what Mr. Milne provisionally called Earthquake Echoes. As an earthquake dies, it does so by a rhythmical succession of similar movements, which are more suggestive of surgings following reflections than of a spasmodic settlement of disjointed strata. The first of these surgings often appears about five minutes after the chief shock, and this, but on a continually decreasing scale, may be repeated many times before the earthquake has ceased.

Solar Radiation.—Report of the Committee.

It was stated that the instrument designed by Prof. Balfour Stewart, F.R.S., and constructed by Mr. Casella for the Committee (many years since) has now been placed in the hands of Prof. Callendar, F.R.S., for comparison with his own pattern of Solar recorder.

Recent Magnetic Work in N. America—by Dr. L. A. BAUER.

No abstract received.

Seismology at Mauritius—by T. F. CLAXTON, Director.

A Milne seismograph was established at Mauritius Observatory in September, 1898. The diurnal waves are of greater amplitude than at any other station. Rapid changes in the vertical have been observed on a good many occasions; on December 5th the boom went out of range after an easterly movement, due to heavy rains at the spot and to the west of it. A gradual change in the vertical is also going on. Air tremors occur every night, dying away at sunrise; they are not sufficiently explained. The amplitudes of earthquake records are disappointingly small.

The Hydro-Aerograph—by F. NAPIER DENISON.

The author has for some years been studying the fluctuations of large bodies of water in their relation to atmospheric pressure, and has constructed excellent apparatus for obtaining automatic records. A brief reference to his work will be found in *Meteorological Magazine*, Vol. xxxii. (1897), p. 74. Mr. Napier Denison has now, we are glad to say, been placed (by Mr. Stupart, the Director of the Canadian Meteorological Service) at Victoria, British Columbia, at the head of what we suppose may be defined as a westernmost look-out station for the Canadian service—something like what we have always thought that Valentia ought to be. Finding himself there, charged with responsibilities as to forecasting and the preparation of weather maps, Mr. Denison has put up a new recorder, and has already succeeded in getting curves which we take to be the instrumental representations of the "calling of the waves," which are often useful monitors on our own coasts. We wish him great success.

Of the following papers we have no abstracts, but we add a word or two respecting some of them :—

H. N. DICKSON.—The Temperature and Salinity of the Surface Water of the North Atlantic during 1896 and 1897.

We believe that this paper did not differ materially from that recently read by the author before the Royal Meteorological Society.

J. HOPKINSON.—The Rainfall of the S.E. Counties of England.

This was a compilation from *British Rainfall*, similar to that for the S.W. of England, mentioned on p. 151 of our last volume.

Dr. van RIJCKEVORSEL.—On some connection between Sun-spots and Temperature.

A. L. ROTCH.—Progress in Exploring the Air with Kites.

A. L. ROTCH.—On the First Crossing of the Channel by a Balloon.

Dr. G. SCHOTT.—Oceanographical and Meteorological Results of the German Deep Sea Expedition in s.s. *Valdivia*.

HEAVY RAINFALLS, AUGUST & SEPTEMBER, 1899.

To the Editor of the Meteorological Magazine.

SIR,—With reference to Mr. Lucas's letter in the *Meteorological Magazine* for October, p. 144, I send the following falls of over one and a half inches which occurred in Northamptonshire during August and September. On August 15th—

	ins.		ins.
Ravensthorp Water Works ...	1·64	Sedgebrook	1·61
Great Brington	1·75	Aldwincle St. Peter	1·58
Althorp	1·68	Oundle	1·83

Of the last-named, 1·63 in. fell between 6.0 and 6.30 p.m.

On September 6th and 7th the fall was—

	ins. 6th.	ins. 7th.		ins. 6th.	ins. 7th.
Berrywood	1·90	·20	Kingsthorp	1·52	·26
Sedgebrook	2·48	·50	Oundle	·45	1·90

Yours truly,

FRED. COVENTRY.

The Vale, Ketton, Stamford, October 19th.

[See also *ante* p. 122.—ED.]

METEOROLOGICAL EXTREMES: II.—TEMPERATURE.

ON p. 132 of our last number we gave, on the high authority of the the late Mr. Blanford, 120°·9 as the maximum for Jacobabad. We have just found a letter (to which we could not reply because we could not read the signature) in which were enclosed the Indian Weather Tables for June 10th and 12th, 1897, giving maxima for Jacobabad of 122°·5 and 123°·5 respectively. Of course Mr. Blanford could not, in 1889, know what was going to occur eight years later.

SMOKE-FOG AND MAXIMUM TEMPERATURE.

To the Editor of the Meteorological Magazine.

SIR,—The effect of smoke-fog in modifying the temperature of our large towns and surrounding districts during calm anticyclonic weather is well known, but the following instance is so remarkable that I think it worthy of record.

From Wednesday to Friday, October 18th to 20th, a dense black fog enveloped the cities of Leeds and Bradford, and the Aire valley from Keighley downwards. It was particularly bad on Friday, October 20th, the atmosphere then being perfectly calm. In the Bradford district the sun never penetrated the smoke-fog, and it was almost as dark as night the whole day.

At Ilkley, 9 miles N.N.W., there was a sharp frost in the morning (min. 28°·4 in Stevenson Screen), and at 8.30 a.m., when I left for Bradford, the sun shone brightly.

As usual on such mornings, I entered the fog on reaching the Aire valley near Shipley.

During the afternoon I went by rail from Bradford to Lancaster, and at about 4.15, when travelling between Shipley and Bingley (4 miles from the centre of Bradford), in the *bottom* of Airedale, I noticed that the thick hoar frost or rime on the trees, grass, etc., remained still unmelted, showing conclusively that the max. temperature during the day had not exceeded 32°. This was, perhaps, not to be wondered at, considering the darkness in the valley. (On the hills above it was brilliantly sunny all day, with a cloudless sky). On passing Bingley the hoar frost disappeared except in the shadows of hedges, walls, etc., showing that the sun had there penetrated the fog at some time during the day.

This state of things continued as far as Keighley. Beyond Keighley the frost entirely disappeared, and the fog rapidly diminished. After passing Skipton and leaving the smoky towns behind, the clear blue sky became visible.

The following day I went on to Garstang, a place situated in pure country, 10 miles S. of Lancaster, where I learned that Friday there had been a day of summer-like weather and temperature, the max. having reached 66°·2 in Stevenson Screen, or about 34° higher than at Bingley! The distance in a straight line from Bingley to Garstang is 39 miles.

Yours truly,

ALBERT WILSON.

4, Eaton Road, Ilkley, October 24th, 1899.

WONDERFUL STORY OF A THUNDERBOLT!

DEEPING ST. JAMES. — During the storm on Sunday week, October 1st, between 5 and 6 o'clock, a thunderbolt fell down the chimney of a house occupied by Mrs. Atkin, near Deeping St. James station. In its passage it grazed the side of Mrs. Atkin's head, leaving a bad scar, and passing out by the open door it exploded in the road, burning fiercely.—*Stamford Post*, October 13th, 1899.

This is a fine specimen of the power of imagination. We accept as facts—(i.) that there was a thunderstorm; (ii.) that the chimney was struck; (iii.) that Mrs. Atkin's head was grazed. But we do not believe in the fall of a "thunderbolt" inasmuch as no such thing has ever been found. Possibly some portion of a brick from the chimney may have been knocked down and so wounded the lady, and as to the final story, the only explanation which occurs to us is that perhaps the discharge scattered the coals in the grate. The only "burning" thunderbolt we ever heard of was the chemical one manufacted by a sprightly youth at Notting Hill, for the express purpose of "taking in" the public—in which he was very successful. See *Quar. Jour. Roy. Met. Soc.*, Vol. XIV., p. 208. We wish that someone in the neighbourhood would ascertain precisely what happened.

DEFINITIONS OF DROUGHT.

To the Editor of the Meteorological Magazine.

SIR,—The suggestion of Mr. H. A. Boys in your issue for August, p. 101, is a reasonable one—that for a "protracted drought" (or any other) the allowance of rain per diem should be on a sliding scale. I have always thought that the definition of drought which appears to be thus far accepted is defective in this respect; for example, this spring we had a drought which has only *once* been exceeded in the over 39 years of my record—it was May 24th to June 17th inclusive, a period of 25 days with only ·01 in. of rain. Yet this does not come into the record as a drought at all, being neither an "absolute" nor a "partial drought," for the ·01 in. so fell that there were but 14 consecutive days rainless. Yet surely such a drought is greater than one lasting 29 days with ·29 in. of rain, which would be recorded as a "partial drought." The one occasion on which the late drought was exceeded was 1893, March 18th to April 14th, 28 days, with ·01 in., on which occasion there was an "absolute drought" of 19 days. It is true the drought this spring would not be so prejudicial as it might have been on account of the excessive rain which preceded it (3·22 in. in 16 days).

We have since had a partial drought, ·32 in. in the 35 days ending August 26th, again, fortunately, following a rainy period.

Yours truly,

T. W. BACKHOUSE.

A COMPASS PLANT.

To the Editor of the Meteorological Magazine.

SIR,—In the September number, at p. 114, there is a short note on "A Compass Plant" that should be explained more fully. This is the *Silphium laciniatum*, one of the compositæ, and is also called Pilot weed, Polar plant, Rosin weed, and so on. It is 3 to 6 feet tall, rarely 11 feet, and has lower radicle leaves 12 to 30 inches long. These leaves in a strong plant, fully exposed on the prairie, will stand erect with their faces toward the east and west, thus having their edges toward the north and south. In the blackest, stormy night, one can feel the edge of the leaf and thus determine the true north. A singular fact in this connection is, that, when planted in a garden, it seems to lose this directive tendency, but the peculiar position of the leaves on the open prairie has been attested by a host of competent observers.

H. A. HAZEN.

September 25th, 1899.

FLOOD IN CAPE TOWN.

WE have been favoured by Mr. Stokes, of Apsley House, Margate, with a copy of the *Cape Times* for August 16th, 1899, giving 15 excellent photo-engravings of the flood in Cape Town, and in the Worcester and Wex River district on August 6th. The streets of Cape Town appear to have had about a foot of water, and outside the town a tramway track and the railway, at more than one place, were washed away. It always seems to us a pity that such volumes of water should be allowed to run to waste, especially now that persons are realising the value of water both for its own sake and because of the power which could be extracted from its fall.

The following are all the data respecting the rainfall which we found in the *Cape Times* :—

	Royal Observatory. in.	Wynberg Hill. in.	Table Mountain. in.
July 31	·40		
Aug. 1	·63	... .	·79
,, 2	1·82	2·64	2·18
,, 3	·18	... .	·79
,, 4	·00		
,, 5	·71		
,, 6	1·57		
Total	5·31		
Total, 1st to 10th ..		7·58	

REMARKS.

Royal Observatory.—On August 2nd, 1·31 in. fell between 1 and 4 p.m.; and on 6th, 1·25 in. fell between 10 a.m. and noon.

Wynberg Hill.—This heavy rain was badly needed. In 1898 between January 1st and August 31st, 42·63 in. fell; the total in 1899 up to date is only 27·60 in., whereof July contributed very little: less than half what fell in 1898.

Table Mountain.—This rainfall of 2·97 in. raised the depth of water in the Woodhead reservoir 24 ft. 5½ in., and this report does not include any record of the further effect produced by the subsequent storm of August 6th.

Another account gives the following details as to the fall on the 6th. Apparently it is the Royal Observatory record differently divided :—

August 6—1 a.m. to 8 a.m.	·70 in.
,, 6—8 a.m. to 10.45 a.m.	·85 ,,
,, 6—10.45 a.m. to 11.25 a.m.	·72 ,,

This rain, though heavy, does not seem one which should have caused so much damage, and there seem to be two explanations—(1) the fall may have been much greater in other parts than at the Royal Observatory: (2) the channel provided is not large enough.

A WET PERIOD, OCTOBER & NOVEMBER, 1899.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall at Hazelhurst has recently been exceptionally heavy. I give the daily record :—

Oct. 26	...	·25 in.	Nov. 3	...	2·11 in.
,, 27	...	1·10 ,,	,, 4	...	·78 ,,
,, 28	...	—	,, 5	...	1·45 ,,
,, 29	...	·61 ,,	,, 6	...	·04 ,,
,, 30	...	·04 ,,	,, 7	...	·78 ,,
,, 31	...	—			
Nov. 1	...	·09 ,,			7·88 ,, in 13 days.
,, 2	...	·63 ,,			

The first five days of November averaged just over 1 inch per day.

During the twenty-six* years, 1873 to 1899, there have been seven instances of 2 inches or more falling within twenty-four hours. The 2·11 in. of November 3rd, began at 4 p.m. on that day, and ended at 8 a.m. on the 4th; but the rain was practically continuous until 9 a.m. on November 6th, a period of 65 hours, during which 4·38 in. fell.

There was also a fall of 1·49 in. on October 1st.

Yours faithfully,

T. P. NEWMAN.

Hazelhurst, Haslemere, Surrey, Nov. 9th, 1899.

[Several other correspondents have sent us their records for the early part of November, and from them we have compiled the following table :—

COUNTIES.	STATIONS.	NOVEMBER				4 Days.
		2nd. in.	3rd. in.	4th. in.	5th. in.	in.
Middlesex.	Staines (Knowle Green)	·67	1·42	·09	1·22	3·40
,,	Camden Square	·30	1·36	·30	1·30	3·26
Surrey.....	Haslemere (Hazelhurst)	·63	2·11	·78	1·45	4·97
,, ...	Chiddingfold	·43	1·62	·59	1·67	4·31
,, ...	Farnham (Great Down, Seale)	·46	1·45	·57	1·30	3·78
,, ...	Guildford (Epsom Road).....	·40	1·34	·52	1·35	3·61
,, ...	Frimley (Ridgemont)	·36	1·44	·68	1·27	3·75
Sussex.....	Burgess Hill (Silverdale Road)	·76	·57	·42	2·19	3·94
Hants	Botley (Curdridge).....	·39	1·73	·62	1·31	4·05
,, ...	Crondall (Warren Corner) ...	·38	1·58	·70	1·30	3·96
Bucks	Slough (Upton)	·21	·91	·47	·95	2·54

* As the Hazelhurst record did not commence until 1888, we believe that the earlier years are from the Lower Street record.—ED.

THE MOON AND THE WEATHER.

To the Editor of the Meteorological Magazine.

SIR,—In opposition to Prof. Hazen, I think we may have strong and convincing evidence of a connexion between two sets of phenomena, while unable, *a priori*, to comprehend the *how* satisfactorily; (take, *e.g.*, the case of sunspots and the magnetic needle).

Prof. Hazen's statement as to the effect of the moon on the barometer, I cannot think exhaustive of what may fairly be said to be known on the subject; still less, of all that is discoverable. Nature is apt to have surprises for those who shelve a subject as being thoroughly understood.

Curiously, just after reading the confident letter in which Mr. Dines tells us what the moon can and cannot do, excluding, *inter alia*, any electrical effect, I found in the *Meteorologische Zeitschrift*, that two able meteorologists, Ekholm and Arrhenius, had been arguing in the Swedish Academy, on a comprehensive basis, that the moon has an influence both on polar lights and on thunderstorms. It is further curious to discover that Prof. Hazen believes in the moon's influence on thunderstorms. In a paper to *Popular Science*, New York,* he says: "There seems good evidence to show that there are more thunderstorms during new than full moon."

Now I confess I find it difficult to understand, *a priori*, how the dead moon can have anything to do with thunderstorms; but I should not thereby be deterred from believing in such influence if a sufficient correspondence has been made out. Prof. Hazen, however, cannot have been, or at least *remained*, in such difficulty. On his own showing, moreover, the moon cannot here act either through pressure or temperature. Is it then a direct electrical effect, or what? Perhaps the professor would kindly say by what *a priori* reasoning he was able to supplement, in this case, as required, the results of observation.

Again, certain definite temperature changes usually accompany thunderstorms. If, then, the moon gives us more thunderstorms at one time than another, can it be truly said that she has no influence on temperature?

Yours faithfully,

ALEX. B. MACDOWALL.

* Given in *English Mechanic*, October 20th.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

OCTOBER.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0-10
1858..	1·58	11	·30	0	50·3	48·3	69·2	59·3	32·9	43·6	..	..	..	..	5·9
1859..	2·53	20	·75	0	50·9	49·2	80·9	57·9	26·6	45·8	..	..	..	..	6·9
1860..	1·77	12	·43	0	50·5	48·6	65·2	57·8	31·4	44·8	..	..	27·2	39·4	5·5
1861..	1·05	10	·39	0	54·4	53·0	74·7	64·4	39·5	48·1	..	..	34·6	44·2	6·2
1862..	3·50	18	·75	0	51·9	49·8	69·4	60·1	31·8	45·2	..	..	24·7	41·1	6·0
1863..	1·62	17	·43	0	51·8	49·7	65·2	58·5	35·1	46·4	..	..	28·2	40·8	6·5
1864..	1·13	7	·43	0	50·6	49·2	67·4	58·7	35·4	43·9	..	..	25·2	39·9	6·1
1865..	6·22	22	1·05	1	50·1	48·4	73·5	59·6	33·4	44·8	..	..	27·8	40·9	5·7
1866..	2·32	14	·89	0	51·2	50·0	68·5	59·2	33·6	45·4	..	..	23·6	37·8	6·7
1867..	1·92	16	·42	0	49·8	48·1	66·0	56·9	31·0	42·4	..	..	25·5	37·6	6·9
1868..	2·54	11	·59	0	47·8	46·1	66·2	57·2	27·8	39·4	..	..	26·4	37·0	5·5
1869..	1·87	12	·71	0	48·7	46·7	74·6	58·1	26·6	42·9	..	..	23·4	39·3	5·5
1870..	3·68	20	·46	0	49·9	48·0	69·7	58·8	31·0	43·1	110·0	86·0	29·0	39·0	5·8
1871..	1·34	12	·34	0	48·7	47·4	67·0	58·5	31·2	41·6	106·4	82·3	29·1	38·5	5·7
1872..	5·20	20	1·05	1	48·1	46·8	65·3	56·0	31·8	41·3	110·4	79·2	29·8	38·5	5·7
1873..	2·97	15	1·04	1	47·7	46·4	73·4	57·0	26·2	40·4	110·7	81·7	20·9	36·8	6·3
1874..	3·34	18	·59	0	52·3	50·4	68·1	59·5	34·3	46·6	109·6	85·3	33·6	44·3	6·3
1875..	4·35	18	·78	0	49·1	47·4	70·2	56·0	32·8	43·7	109·0	75·5	32·1	41·6	7·0
1876..	1·40	14	·43	0	52·3	50·7	71·2	60·0	34·2	47·8	111·1	82·8	26·4	43·3	6·8
1877..	1·97	16	·44	0	48·8	46·4	67·5	58·9	30·9	41·7	106·3	89·1	26·6	37·7	5·1
1878..	1·99	13	·50	0	50·5	48·7	73·3	59·4	31·6	45·3	108·9	87·3	26·6	41·4	6·2
1879..	·80	9	·33	0	49·1	47·5	67·4	57·1	33·4	43·9	116·9	80·1	29·0	40·1	6·7
1880..	5·78	20	·99	0	45·8	44·1	66·3	54·5	29·6	40·9	110·8	76·7	26·7	38·7	7·2
1881..	2·99	12	1·03	1	44·8	42·7	63·4	52·6	27·3	39·6	112·4	83·9	20·6	34·1	5·7
1882..	4·96	23	·59	0	50·4	48·8	70·4	58·0	31·9	44·5	116·7	80·8	27·2	41·6	7·5
1883..	1·75	14	·46	0	50·1	48·4	64·6	57·7	36·9	45·0	103·6	81·1	28·4	39·7	5·7
1884..	·99	10	·43	0	49·0	46·6	63·9	57·1	32·2	41·9	105·8	81·2	25·6	36·7	5·8
1885..	3·73	17	·98	0	46·0	43·8	60·9	53·1	33·4	41·1	104·8	75·9	25·8	35·7	6·4
1886..	2·43	23	·47	0	52·8	51·3	78·8	60·3	39·6	47·8	112·2	81·1	32·3	42·3	6·2
1887..	1·24	9	·61	0	44·6	42·3	63·6	53·2	25·4	39·0	103·4	80·3	23·2	35·2	5·8
1888..	1·23	7	·51	0	45·4	43·7	68·8	55·4	28·2	38·9	99·3	80·1	21·3	33·1	5·2
1889..	3·75	22	·73	0	48·0	46·7	60·6	55·9	35·5	43·1	96·8	78·9	31·8	38·4	7·0
1890..	1·20	13	·28	0	48·6	46·4	68·5	57·9	23·8	42·4	109·4	82·7	16·8	37·9	5·1
1891..	4·80	20	·64	0	50·7	48·9	65·9	58·3	29·7	45·0	104·0	83·3	24·4	39·9	5·4
1892..	3·78	21	1·11	1	45·3	43·5	60·4	53·0	29·2	39·4	101·9	78·8	22·3	34·3	5·4
1893..	3·87	16	1·15	1	50·8	48·5	66·3	59·3	30·9	44·9	106·3	88·2	27·2	41·3	5·0
1894..	4·45	17	1·35	1	49·6	47·9	62·1	56·9	31·2	45·2	101·9	77·1	29·2	41·8	7·5
1895..	2·84	14	1·14	1	45·9	44·1	74·4	54·1	26·6	40·5	111·9	75·8	24·1	36·3	6·0
1896..	3·05	18	·67	0	46·1	44·3	62·9	53·6	29·2	40·5	100·6	76·2	24·8	35·3	6·0
1897..	·56	9	·14	0	49·7	47·7	67·2	58·4	31·9	44·3	106·9	84·5	29·8	39·0	5·6
Mean ...	2·71	15	·66	0·2	49·2	47·4	68·1	57·5	31·4	43·3	107·4	81·3	26·6	39·0	6·1
Extremes	6·22	23	1·35	1	54·4	53·0	80·9	64·4	39·6	48·1	116·9	89·1	34·6	44·3	7·5
	·56	7	·14	0	44·6	42·3	60·4	52·6	23·8	38·9	96·8	75·5	16·8	33·1	5·0

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1899.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	74·2	31	34·4	5	63·3	43·9	43·1	72	120·4	29·2	1·38	12	5·4
Malta	84·3	25	54·3	4	74·7	60·1	58·0	75	150·0	48·7	·00	0	1·8
Cape of Good Hope	82·9	22	36·1	26	69·4	49·2	47·1	80	...	...	3·48	7	3·0
Mauritius	82·3	3	60·3	31	78·0	68·2	64·5	76	153·6	52·0	1·73	11	5·7
Calcutta	104·9	8	70·4	10	95·9	78·6	77·5	76	153·8	69·8	9·65	9	6·0
Bombay	92·2	28	77·9	1	90·5	81·2	75·5	72	138·5	72·7	·08	2	3·5
Ceylon, Colombo	92·2	2, 5	70·5	20	88·8	77·3	75·9	83	148·8	66·5	17·73	20	5·5
Melbourne	70·0	2	35·9	29	59·8	45·9	46·0	79	128·2	32·1	3·54	13	6·6
Adelaide	76·7	13	39·9	29	64·9	48·5	46·1	72	134·0	31·4	2·36	11	4·2
Sydney	72·0	3	44·3	24c	65·8	51·3	46·3	75	117·8	35·0	6·82	10	3·4
Wellington	65·0	6	37·0	11	55·5	45·9	42·3	74	115·0	30·0	6·87	26	5·3
Auckland	73·0	7	41·0	29	61·3	48·8	43·9	67	125·0	33·0	2·98	15	5·0
Trinidad	95·0	9a	66·0	Sev.	93·2	69·4	70·1	72	169·0	60·0	·52	5	...
Grenada	86·0	8b	73·0	24d	83·9	74·5	67·9	67	150·8	...	·49	9	1·3
Toronto	80·0	2	32·9	15	64·7	45·9	46·4	72	101·4	28·0	3·29	12	5·7
New Brunswick, Fredericton	77·7	25	30·0	6	63·0	38·1	35·4	50	...	...	2·64	10	4·6
Manitoba, Winnipeg	76·4	9	21·0	13	62·0	39·6	...	71	...	...	2·20	10	6·6
British Columbia, Esquimalt	...	...	...	...	...	...	...	...	...	...	...	...	...

a—and 23. *b*—and 25. *c*—and 27. *d*—and 28, 29.

Remarks.

Malta.—Adopted mean temp. 65°·9, or 1°·9 above average. Mean hourly velocity of wind 8·7 miles, or 1·4 below average. Mean temp. of sea 68°·4. L on 2nd.
J. F. Dobson

Mauritius.—Mean temp. of air 0°·1 and of dew point 0°·2 above, and rainfal 2·60 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, o 0·5 below average; extremes, 26·2 on 21st and 2·0 on 28th; prevailing directio S.E., and variable. L on 3rd; T on 4th and 7th. A. Walter

Ceylon, Colombo.—Mean temp. of air 82°·4, or 0°·1 below, of dew point 0°· above, and rainfall 5·84 in. above, their respective averages. Mean hourly velocity of wind 9·9 miles; prevailing direction S.W. Max. velocity on 14th, 25 miles pe hour, for 45 minutes. T88 on 7 days. L on 7 days. H. O. Barnard

Adelaide.—Mean temp. of air 0°·8 below, and rainfall ·50 in. below, the averag of 42 years. A fairly good, seasonable month. C. Todd, F.R.S

Sydney.—Temp 0°·9 below; humidity 8·7 above; and rainfall 1·60 in. above, thei respective averages. H. C. Russell, F.R.S

Wellington.—A very wet, unpleasant month; winds chiefly S. and S.E., and stron from 12th to 15th, also strong N.W. wind on 18th; generally dull, damp weathe H on 12th: fog on 4 days. Earthquake on 22nd. Mean temp. 1°·3 below, and 1·98 in. above, their respective averages. R. B. Gori

Auckland.—Unusually dry for the time of the year, the rainfall being 1·25 i below the average. Mean temp. nearly 2° under the average. T. F. Cheeseman

Trinidad.—Rain 3·13 in. below the average of 30 years. J. H. Har

SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·56	XI.	Builth, Abergwesyn Vic.	5·67
II.	Dorking, Abinger Hall .	2·48	,,	Rhayader, Nantgwillt...	4·96
,,	Birchington, Thor	1·74	,,	Lake Vyrnwy	4·84
,,	Hailsham	2·56	,,	Corwen, Rhug	4·31
,,	Ryde, Thornbrough	2·68	,,	Criccieth, Talarvor	2·69
,,	Emsworth, Redlands ...	2·65	,,	I. of Anglesey, Lligwy..	3·50
,,	Alton, Ashdell	3·43	,,	I. of Man, Douglas	3·53
III.	Oxford, Magdalen Coll..	2·69	XII.	Stoneykirk, Ardwell Ho.	2·37
,,	Banbury, Bloxham	2·24	,,	New Galloway, Glenlee	4·62
,,	Northampton, Sedgebrook	2·79	,,	Moniaive, Maxwelton Ho.	4·05
,,	Stamford, Duddington..	...	,,	Lilliesleaf, Riddell	1·71
,,	Alconbury	2·58	XIII.	N. Esk Res. [Penicuick]	3·60
,,	Wisbech, Bank House...	2·83	XIV.	Glasgow, Queen's Park..	3·27
IV.	Southend	1·89	XV.	Inverary, Newtown	8·92
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	7·88
,,	Colchester, Lexden	1·84	,,	Islay, Gruinart School...	2·49
,,	Rendlesham Hall	1·90	XVI.	Dollar.....	4·61
,,	Scole Rectory	1·98	,,	Balquhidder, Stronvar...	7·22
,,	Swaffham	1·99	,,	Coupar Angus Station...	1·06
V.	Salisbury, Alderbury ...	3·04	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	2·39	XVII.	Keith H.R.S.....	1·38
,,	Blandford, Whatcombe .	3·29	,,	Forres H.R.S.	·89
,,	Ashburton, Holne Vic...	4·96	XVIII.	Fearn, Lower Pitkerrie..	·93
,,	Okehampton, Oaklands.	4·17	,,	S. Uist, Askernish	4·37
,,	Hartland Abbey	5·94	,,	Invergarry.....	6·35
,,	Lynton, Glenthorne ...	5·01	,,	Aviemore H.R.S.	1·19
,,	Probus, Lamellyn	3·60	,,	Loch Ness, Drumnadrochit	3·05
,,	Wellington, The Avenue	2·45	XIX.	Invershin	2·46
,,	North Cadbury Rectory	2·10	,,	Durness	6·36
VI.	Clifton, Pembroke Road	3·69	,,	Watten H.R.S.....	2·01
,,	Ross, The Graig	2·95	XX.	Dunmanway, Coolkelure	4·22
,,	Wem, Clive Vicarage ...	2·76	,,	Cork, Wellesley Terrace	1·52
,,	Wolverhampton, Tettenhall	2·97	,,	Killarney, Woodlawn ..	2·76
,,	Cheadle, The Heath Ho.	3·23	,,	Caher, Duneske	1·54
,,	Coventry, Priory Row ..	2·35	,,	Ballingarry, Hazelfort...	1·59
VII.	Grantham, Stainby	2·52	,,	Limerick, Kilcornan ...	1·02
,,	Horncastle, Bucknall ...	2·62	,,	Miltown Malbay	2·54
,,	Worksop, Hodsck Priory	2·70	XXI.	Gorey, Courtown House	2·03
VIII.	Neston, Hinderton	3·47	,,	Moynalty, Westland ...	1·97
,,	Southport, Hesketh Park	3·09	,,	Athlone, Twyford	1·55
,,	Chatburn, Middlewood.	2·89	,,	Mullingar, Belvedere ...	1·46
,,	Duddon Val., Seathwaite Vic.	5·81	XXII.	Woodlawn	2·18
IX.	Melmerby, Baldersby ...	2·03	,,	Crossmolina, Enniscoe ..	3·35
,,	Scarborough, Observat'y	2·59	,,	Collooney, Markree Obs.	2·39
,,	Middleton, Mickleton ...	2·65	,,	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	3·12	XXIII.	Warrenpoint.....	2·20
,,	Bamburgh	1·33	,,	Seaforde..	1·86
,,	Keswick, The Bank.....	6·87	,,	Belfast, Springfield	2·55
XI.	Llanfrechfa Grange	3·84	,,	Bushmills, Dundarave..	1·98
,,	Llandovery	4·92	,,	Stewartstown	1·98
,,	Castle Malgwyn	4·28	,,	Killybegs	3·45
,,	Brecknock, The Barracks	3·86	,,	Horn Head	2·18

OCTOBER, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours Dpth	Greatest Fall in 24 hours Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·03	— ·86	1·02	27	10	63·4	1	33·5	8	0	7
II.		Tenterden ...	2·33	— 1·70	·82	1	14	65·0	23	32·5	14	0	11
,,		Hartley Wintney ...	2·64	...	1·30	27	11	65·0	17	29·0	14	4	11
III.		Hitchin ...	3·14	+ ·07	1·59	1	12	62·0	16	30·0	17	5	...
,,		Winslow (Addington) ...	2·27	— ·82	·93	27	10	66·0	12	26·0	19	9	11
IV.		Bury St. Edmunds (Westley)	1·89	— 1·38	·57	27	9	60·0	27	31·0	6	...	...
,,		Norwich (Brundall) ...	2·30	...	·79	27	12	65·2	12	29·8	20	3	16
V.		Winterbourne Steepleton ...	2·26	...	·82	27	10	63·9	22	26·9	14	5	11
,,		Torquay (Cary Green)	1·99	...	·79	27	11	62·4	10*a*	36·2	14	0	1
,,		Polapit Tamar [Launceston]..	3·34	— 1·59	1·13	1	13	67·2	18	26·7	14	5	5
VI.		Stroud (Upfield) ...	2·30	— ·73	·50	1, 29	11	61·0	17	34·0	20	0	...
,,		ChurchStretton(Woolstaston)	3·30	— ·47	1·20	1	10	65·0	17	35·0	15	0	7
,,		Worcester (Diglis Lock) ...	2·10	— ·73	·56	1	11	...	...	...	...	...	...
VII.		Boston ...	2·83	— ·28	1·25	1	9	65·0	17	32·0	18*e*	2	...
,,		Hesley Hall [Tickhill]...	2·90	— ·20	1·36	1	11	65·0	17	26·0	20	6	...
,,		Breadsall Priory ...	2·85	...	·72	1	9	63·0	...	31·0	...	2	7
VIII.		Manchester(PlymouthGrove)	3·06	— ·31	·73	13	13	68·0	19	31·0	15	3	7
IX.		Wetherby (Ribston Hall) ...	3·61	+ ·48	2·25	1	10	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	5·16	— ·87	1·60	1	12	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·38	— 1·27	·81	1	10	64·0	12	30·0	20	6	12
X.		Newcastle (Town Moor) ...	1·78	— 1·34	1·29	1	9	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	13·34	+ 2·75	3·30	29	13	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	3·29	— 1·25	·67	27	12	...	...	...	...	...	...
,,		Haverfordwest	3·76	— 1·39	1·23	29	14	61·7	17	30·4	14	1	10
,,		Aberystwith (Gogerddan) ...	4·12	— 1·23	1·10	29	8	70·0	17*b*	...	...	...	...
,,		Llandudno...	3·65	+ ·26	·93	1	12	70·5	18	38·5	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	3·26	·00	1·10	29	8	63·0	18	26·0	15	6	...
XIII.		Edinburgh (Blacket Place)...	1·59	...	·48	1	13	67·4	19	32·2	15	0	3
XIV.		Colmonell ...	3·47	...	·88	3	14	66·0	20*c*	28·0	14	...	...
XV.		Tighnabruaich	5·08	...	·77	28	16	55·0	11*d*	34·0	13*g*	0	...
,,		Mull (Quinish)...	4·66	— ·63	1·05	2	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	2·30	— ·66	·80	30	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·95	— 1·29	·20	1, 25	11	63·6	10	27·1	15	1	...
XVII.		Braemar	1·78	— 1·83	·36	30	15	60·2	10	25·0	15	5	18
,,		Aberdeen (Cranford)	·89	...	·15	9	16	70·0	10	30·0	14*h*	6	...
,,		Cawdor (Budgate) ...	1·26	— 1·47	·37	3	14	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	4·42	— ·23	·86	4	13	...	...	...	...	...	...
,,		Glencarron Lodge...	10·58	...	1·70	11	23	67·0	19	30·0	15	2	...
XIX.		Dunrobin ...	2·05	— 1·26	·45	11	12	64·0	19	33·8	13	0	...
,,		S. Ronaldshay (Roeberry) ...	3·58	— ·15	·78	3	18	63·0	19	35·0	13*i*	0	...
XX.	IRELAND.	Darrynane Abbey...	1·84	...	·21	26	17	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·29	— 1·53	·77	29	12	61·5	9	29·0	6	5	...
,,		Broadford (Hurdlestown) ...	1·72	...	·38	25	14	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	1·73	— 1·56	·58	29	15	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·54	— 1·84	·26	11	11	65·1	18	32·9	6	...	...
XXII.		Ballinasloe	1·77	— 1·22	·31	11	13	63·0	18	29·0	14	...	...
,,		Clifden (Kylemore)	4·45	...	·96	11	17	...	...	...	...	...	...
XXIII		Waringstown	2·71	·00	·50	1	15	68·0	18	30·0	15*j*	8	...
,,		Londonderry (Creggan Res.).	1·77	— 1·90	·51	11	15	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	1·98	— 1·12	·49	11	14	63·0	18*f*	30·0	20	1	8

+ Shows that the fall was above the average ; — that it was below it.

a—and 11. *b*—and 18, 19. *c*—and 28. *d*—and 18. *e*—and 20. *f*—and 19.
g—and 14. *h*—and 30. *i*—and 24. *j*—and 19, 23.

METEOROLOGICAL NOTES ON OCTOBER, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—There were several wet days at the beginning and end of the month, but from the 6th to the 23rd brilliant sunshine prevailed, except on the 12th. The max. temp. was 60°, or over, on 14 days. Heavy dews and foggy nights occurred from 17th to 23rd. TS with heavy R and high wind on 1st. Duration of sunshine 154 hours.

HARTLEY WINTNEY.—A pleasant month, warm and dry. Although heavy R fell on 27th the total for the month is ·67 in. below the average, and R was much needed at the close. There was a period of calm weather from 7th to 25th, with dense fog each morning. Ozone was registered on 11 days, with an average of 4.

WINSLOW, ADDINGTON.—Little R fell until after the 25th, and there were many frosty and foggy mornings. On the morning of the 26th, at about 6.45 a.m., a fine rainbow was seen, followed by a wet day. Fog on 8 days.

BURY ST. EDMUNDS, WESTLEY.—A month of high barometer. R and temp. below the average. Distant T on 1st.

NORWICH, BRUNDALL.—A fine month, with average temp., and rainfall ·75 in. deficient. Many very bright days in the second and third weeks. L on 13th. Fog on 5 days.

WINTERBOURNE STEEPLETON.—A very fine month. Between 5th and 25th, inclusive, the days were almost all sunny and bright, but towards the end of that period the mornings were rather foggy, soon clearing.

TORQUAY, CARY GREEN.—R 2·24 in. below the average. Mean temp. 54°·1, being 2°·6 above the average. Duration of sunshine 130 hours 35 mins., being 18 hours 25 mins. above the average; four sunless days.

POLAPIT TAMAR [LAUNCESTON].—A fine dry month, remarkable for absence of strong winds. Fog on 7 days.

STROUD, UPFIELD.—Fog daily from 20th to 24th. Westerly gale on 3rd.

CHURCH STRETTON, WOOLSTASTON.—Heavy R on 1st; otherwise dry and seasonable, without much frost. Gales on 3rd and 29th. Mean temp. 49°·6. H on 13th.

MANCHESTER, PLYMOUTH GROVE.—Fine autumn weather prevailed during the greater part of the month. R storm and T and L on 10th. Fog on 5 days. Mean temp. 45°·8.

WALES.

HAVERFORDWEST.—An unusually fine month. The first three days were wet and stormy, after which, till the 26th, the general character of the weather was fine. From the 26th to the end it was very unsettled. The wind reached the force of a gale on four days. Springs were very low and much more R is needed to bring them back to their normal volume. Agricultural operations well advanced.

ABERYSTWITH, GOGERDDAN.—A very fine and warm month.

SCOTLAND.

CARGEN [DUMFRIES].—L at night on 21st and 22nd.

EDINBURGH, BLACKET PLACE.—Mean temp. 1°·9 above, and R half, the average. Duration of sunshine slightly below the normal. Solar halo at 11 a.m., on 6th; lunar halo on 18th. H at 10 p.m. on 13th. TS with R and H on 30th at 7.35 p.m.

COLMONELL.—R 1·25 in. below, and temp. 2°·6 above, the average of 23 years. Gales on 6 days. T and L on 31st.

TIGHNABRUAICH, CRAIGANDARAICH.—An average rainfall. The best display of T and L of the year occurred on the 30th.

MULL, QUINISH.—On the whole a fine month, with unusually high temp., and R below the average. No sign of winter up to the close. The R on 2nd, 1·05 in., came from N.E., which is most unusual.

BRAEMAR.—A month of excellent weather.

ABERDEEN, CRANFORD.—A fine and warm month, with S.W. and W. winds.

S. RONALDSHAY, ROEBERRY.—The first and latter parts of the month were stormy and unsettled, but the middle was fine. Mean temp. 47°·6, being above the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—Another dry month. The first part was very fine, but rather cold; the end was wild and rather stormy. H on 30th.

BROADFORD, HURDLESTOWN.—A very dry October. R 1·11 in., and rainy days 4, less than the average for 15 years. Fog on 3 days.

DUBLIN, FITZWILLIAM SQUARE.—A quiet, foggy, but withal, fine month. There was large range of temp., cold, foggy nights, alternating with sunny, warm days. The weather broke up on 24th, and to the end of the month R fell frequently. Mean temp. 50°·2, being 0°·5 above the average. L on 29th. High winds on 7 days, attaining the force of a gale only on 29th. Fog on 13 days. Solar halo on 18th. Lunar halos on 17th and 18th. H on 12th.

OMAGH, EDENFEL.—With seventeen fine and mostly brilliant days, the rainy and unsettled condition of the remaining fourteen was unable to destroy its general good character. Owing to the absence of frost, of any severity, the autumn tints never were more magnificent than they were up to the close of this month.

THE NEW YORK
PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

BRITISH RAINFALL.

Subscriptions of £1 or upwards received between November 11th and December 11th :—

	£	s.	d.
Torquay Corporation	1	0	0

	£	s.	d.		£	s.	d.
Esdaile, The Rev. W.	1	0	0	Hodgkin, Dr.			
Hanshall, E., Esq., C.E.	2	2	0	McEwan, J., Esq.			

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy.)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Royal Meteorological Societies, and of the British Astronomical Association; Articles by various eminent Astronomers, English, American, and Continental; Correspondence on topics of interest connected with the Science; Notices of Observatories, Publications and current Discoveries. Notes on Meteors, Variable Stars, on Lunar Formations, etc., also are supplied for the assistance and direction of observers.

The Observatory was founded in 1877, and has become an established and very useful publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory," Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 10s.

NOTICES.

It is requested that all Books for Review, and Communications for the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in the letters published in this Magazine rests with their respective authors.

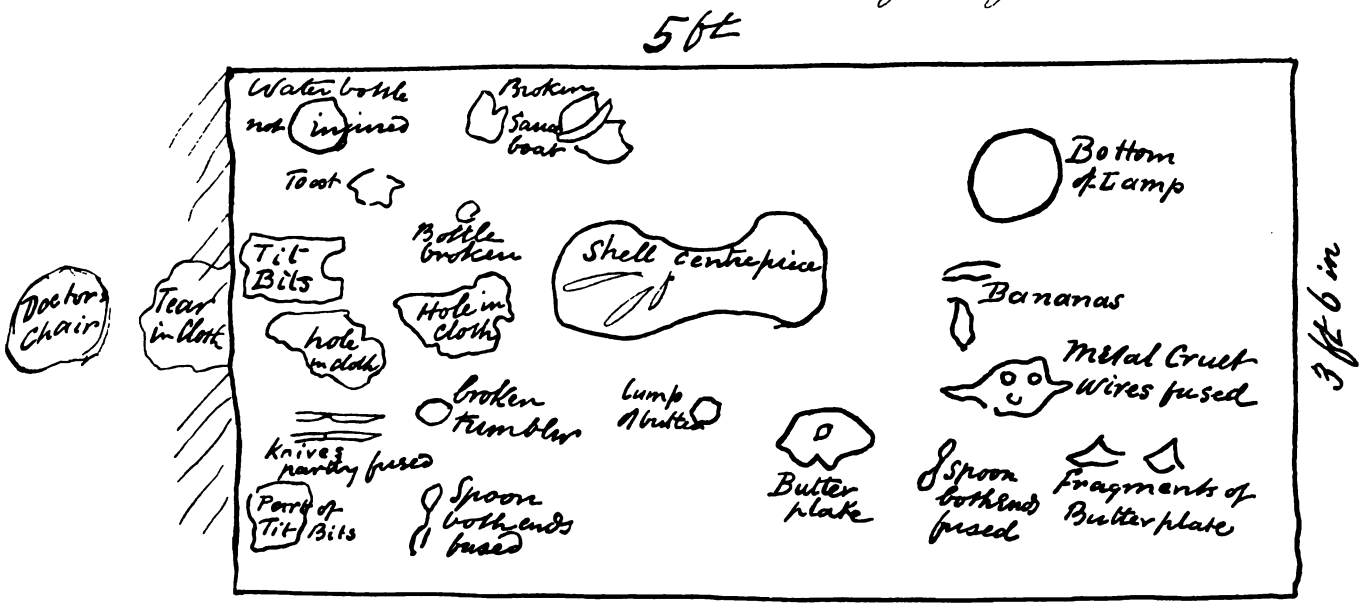
METEOROLOGICAL MAGAZINE.

COMPLETION OF SETS.

Notice is hereby given that on and after December 31st next numbers 201 to 360 will be withdrawn from individual sale, and can thereafter be obtained only in complete volumes. Number 360 is the last of Volume XXX.—the first series, to which an Index has been published. Volume V. is out of print, and of several others very few copies remain.

THE NEW YORK
PUBLIC LIBRARY
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

"Plan of the Table after the Lightning Stroke."



THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCVII.] DECEMBER, 1899. [PRICE FOURPENCE, *or 5s. per ann. post free.*

THE AIMS OF METEOROLOGY.

THE exquisitely printed work, mentioned below,* puzzles us much. From its style we should without hesitation attribute it to Prof. Abbe, but it contains a second title, which is as follows: Part III. (not iii.A as on the other title). *Report on the Meteorology of Maryland*, prepared by direction of WILLIS L. MOORE, Chief of U.S. Weather Bureau, by CLEVELAND ABBE, O. L. FASSIG, and F. J. WALZ. And yet at the head of the text we again have the first title, and the name of Cleveland Abbe. As it begins with page 219 we infer that it is Part III., or III.A, of a volume to be called "*Report on the, &c.,*" but if so, what is meant by "Special Publication, Vol. 1."? It seems rather difficult to see how it is to be catalogued: probably under "Maryland," with references from "Abbe," "Clark," "Fassig," "Moore," and "Walz"!

Although consisting of little more than a hundred pages, this article covers nearly all branches of meteorology, and (except that mathematics are absent) is really the outpouring of the mind of one of the leaders of meteorology of the present day. The *raison d'être* of the work is to tell meteorologists at what they ought to aim; and few persons are so competent to do that as is Prof. Abbe; but he does more, for he packs in a mass of facts and dates which make the perusal of the article not merely an instructive guide to the future, but also very useful as a record of past progress.

So many persons seem to consider that the object and duty of a meteorologist begin and end with punctually reading and recording a barometer, three or four thermometers, and a rain gauge, that we think it will be generally useful to reprint the following section of Prof. Abbe's article:—

SPECIAL OBSERVATIONS AND INVESTIGATIONS.

"While the national bureaus collect data for the study of the atmosphere, they have it in their power to make daily applications

* Maryland Weather Service, Wm. Bullock Clark, Director. The Aims and Methods of Meteorological Work, especially as conducted by National and State Weather Services by Cleveland Abbe. (Special Publication, Vol. I., Part iii.A). The Johns Hopkins Press. Baltimore. July, 1899. Royal 8vo. 111 pages. 13 plates.

of the useful knowledge thus acquired. Those bureaus that cover a large area are generally able to make rational predictions as to the probable weather of the coming twenty-four hours and, especially, to foresee the development and approach of severe storms. This is considered to be a primary duty to the public, since in this way they can render an immediate return for the money spent in the study of the atmosphere. In some bureaus the attention given to practical applications may seem to be too large in proportion to the needs of the fundamental study of the atmosphere. But this is probably an unjust criticism. Theoretical meteorology is not yet the predominating feature in the science. Our progress in unravelling the difficulties of meteorological problems is necessarily so slow and so dependent upon the general progress of mathematical physics that we may compare theoretical meteorology to the slow-growing pines, beeches and oaks of the forest which, when young, are protected by the rapid-growing and short-lived trees, but become the masters of the forest when the latter have died away.

"While, therefore, keeping alive the study of theoretical meteorology, most of the national weather bureaus have developed appropriate lines of useful work in addition to the daily storm and weather predictions already mentioned. Among these we may enumerate the following :—

1. The continuous record of all features of the weather is kept as an official record for use in the courts of law, especially a record of the high winds that can produce damage or destruction of property ; a record of heavy rains within short periods of time, such as produce destructive floods in cities and rivers ; a record of general rains, on which the general *régime* of the rivers depends.

2. A record of every climatic feature that is supposed to affect local agriculture, especially frosts, droughts, maximum and minimum temperatures, rainfall and sunshine, depth of snow and evaporation.

3. A record of the heights of rivers for the prediction of rising and falling water, and the study of erosion.

4. A record of the amount of sunshine and cloudiness in its bearing on the growth and health of animals and plants.

5. A record of the temperature of the soil at different depths for agricultural studies, and at great depths for geological studies.

6. A record of the amount of evaporation from the surface of fresh water and its bearing upon the storage of water for irrigation.

7. The record of thunderstorms and of damage by lightning, hail and wind gusts.

8. Observations on terrestrial magnetism, especially in case that this is not otherwise provided for by some other office or bureau of the respective governments. This record is not kept because any very important relation has yet been shown to exist between meteorology and terrestrial magnetism ; but there is a widespread belief that intimate relations of this character do exist and that the two subjects must be considered as cognate branches of terrestrial physics.

Continuous photographic records of the movements of the magnetic needle and of earth currents are kept for comparison with other phenomena, astronomical or terrestrial.

9. Earthquakes and seismic phenomena belong to geology, but in the absence of systematic attention to the subject by other bureaus, the meteorological records are often the principal source from which observations are drawn. It is also recognized that occasionally earthquakes and volcanic eruptions may be determined by meteorological conditions. In general, both earthquakes and oceanic tides and a certain class of atmospheric phenomena may be simply different manifestations of the tidal forces of the sun and moon, and it is appropriate that the meteorologist should join with other students of terrestrial physics in contributing to elucidate the phenomena.

NEW YORK PUBLIC LIBRARY ASTOR, LENOX AND TILDEN FOUNDATIONS.

10. The registration of tides in the ocean and fluctuations in the levels of the lakes with a study of these as far as they are affected by atmospheric changes.

11. The climatic conditions that affect health, disease and death for the students of hygiene.

12. The observation of the dust in the atmosphere, both as to its quantity and character and a study of its relations to disease, organic life, the production of fog and rain and the radiation of heat, and other phenomena.

13. The registration and study of atmospheric electricity and the elucidation of its origin and function in meteorology.

14. The observation of aqueous vapour, ozone, carbonic acid gas, ammonia, and other chemicals dispersed in small quantities through the otherwise pure air, and the study of their diverse influences on rock weathering, on animal and vegetable life.

15. Optical phenomena, such as the blueness of the sky and its relation to photographic effects, and its dependence upon the free moisture in the air: The polarization of sky light and its dependence on the moisture: solar and lunar halos and coronæ, their dependence upon moisture and their relation to storms.

16. The study of the clouds, their structure and method of formation; their altitude and motions.

17. Observations of evaporation and its relation to irrigation, water-storage and the growth of plants.

18. The depth of frost in the ground and its relation to the foundations of roads and buildings.

19. The relation between rainfall and evaporation on the one hand, and the quantity of water flowing in the rivers on the other.

20. The formation of frost-work at the surface of the ground and its relation to the soil beneath.

21. The formation of sleet or ice on the branches and leaves of trees and plants or on telegraph wires, and the injury done thereby to agriculture and business.

22. The record of the flow of water from springs, the flow of underground water, the temperature of spring water, all in relation to the water supply.

23. The comparison and standardization of meteorological instruments and apparatus, especially of the thermometers, barometers, anemometers, rain-gauges, sunshine recorders, actinometers, sextants and other apparatus used by explorers who keep meteorological records; the improvement and invention of self-registering apparatus.

24. The study of atmospheric absorption of solar energy by means of thermal, optical and chemical methods.

25. The study of the radiation of heat by the earth and air, the clouds and the invisible vapour.

26. The resistance to the motion of the air when opposed by various obstacles, or the effect of the wind on sails and buildings.

27. A record of the phenomena of the aurora, and the study of its connection with magnetic disturbances and natural electric currents on telegraph wires, and with the condition of the atmosphere as to wind and moisture.

28. Records of the audibility of sound and the visibility of signals in fogs, for use in marine signalling.

29. The education of the public, and the dissipation of popular errors by teaching, lecturings and popular writings."

There may be some errors in the work, but we have not noticed one of any importance. Those Englishmen who are always expatiating upon the errors of aneroids may perhaps feel a little indignant at the (perfectly true) remark on page 230, that "The aneroid barometer is not affected by the changes in the force of gravity," while others may feel their "gravity" (of another kind) slightly and pleasantly disturbed.

There is one sentence on page 287 which we regret to see: "The value of the lightning rod as a protection is still considered problematic by many; the question should be settled by careful enquiry." This, in an official publication in the country of Franklin, by one of the most able men in the country, and more than a century after the lightning rod began to save thousands of lives, is certainly remarkable. It will be seen that the author does not personally adopt the view, but he writes of the "many," and says that the question "should be settled," which implies that it is not settled yet. Probably the foundation of his doubt is the bad practice of a *genus homo*, which is, we believe, only to be found in the U.S.A., viz.: "the Lightning Rod man."*

* See the section on "Lightning Rod Swindles," in *Plain Directions for the Construction and Erection of Lightning Rods*, by J. PHIN, C.E. New York, 1873.

LIGHTNING AT DINNER.

AT 7.30 p.m., on Sunday, the 13th August, 1899, Labuan, North Borneo, was visited by a very severe thunderstorm, during which the house of the Government Medical Officer, the Medical Officer himself, and a tree near the Deputy Governor's house, were struck by lightning. The quarters and offices of the Eastern Extension Telegraph Company, which are situated midway between the above mentioned places, and within a quarter of a mile from them, escaped injury.

The Medical Officer's house is what is known as a native house, that is to say, it is built of wood, thatched with ripa palm leaves, and partitioned with palm leaves. It stands on wood piles about 4 feet long.

The lightning struck the point of one of the gables, passed down the king-post immediately beneath it, to the beam supporting the lower end of the king-post, thence it jumped about 8 feet to an iron rod, from which a large metal lamp was hanging, beneath which the table was laid for dinner, from the lamp to the handle of the centre-piece immediately below it, through the tablecloth, the table, down the doctor's clothes and legs, through the floor, down two piles, to earth. In transit it split the king-post into two pieces; the detached pieces knocked a hole in the roof, and then fell part way down through the ceiling into the dining-room below.

The iron rod from which the lamp was suspended, and the horizontal beam, were uninjured. Secured to the bottom of the lamp by thumbscrews was a brass plate, for catching drops of oil; this was knocked off on to the table. From the bottom of the lamp to the handle of the centre-piece below was about 15 inches. The centre-piece was composed of a pair of pearl shells, mounted, with an ornamental handle of metal, and stood on four metal legs screwed into the shells, the handle and legs not being in contact. The top of the handle was slightly fused. There was a join in the wood top of the table under one of the legs of the centre-piece, the lightning split a piece of wood off the edge of the join, and knocked a hole in the tablecloth that could be covered by a full-sized outstretched hand; a portion of the cloth so torn was doubled underneath and led into another hole, which could be covered by a closed hand.

The flash then appears to have gone through the table, making a small hole at the end of the join, which was slightly blackened, as from smoke, on the underneath side; it then jumped on to the hanging portion of the tablecloth, carrying away a piece 15 in. broad.

The doctor was having dinner, and sitting at this end of the table; having just come in from a long round, he had not troubled to dress, but changed into native costume, consisting of a loose jacket and sarong (a piece of cloth fastened round the waist and reaching to the ground)

The lightning having passed down the end of the tablecloth which was resting in the doctor's lap, continued its way down his sarong, tearing it in a similar manner, paralysing his legs from the knees downward, and making several superficial burns. He was also knocked off his chair and rendered insensible for a moment. He remembered seeing sparks, but not hearing anything of the thunder. He had just finished his fish. "Tit Bits" was lying at his side on the table, and he was reading it while he was having his dinner, this necessitated his leaning forward. The flash came just at the instant that the boy was changing his plate—the doctor having sat back to enable him to do so; this was most fortunate, as had he been leaning forward reading he would most probably have been struck on the head. A piece of "Tit Bits," the size of half a cheese-plate, was torn out of the top of the newspaper. The clean plate which the boy was putting on to the table was knocked out of his hand, himself being uninjured.

The floor was not close-jointed, so the flash probably found its way down through the cracks, thence it jumped about four feet on each side, and split two of the piles, eight inches in diameter, into eleven pieces. These pieces were lying about nine feet from the holes, where the ends were in the earth. They were split longitudinally, with the ends pointing towards the respective holes.

A sideboard, standing about five feet from the table, had some glasses broken that were standing on the top; the door and bottom of the left hand cupboard were affected, the former being blown open, and the latter downwards, letting a lot of aërated water fall through on to some more below, most of it being smashed.

The accompanying sketch will give the best idea of the state of the dinner table.

Absence of marks of burning, in bad conductors like wood, cloth, &c., and no horizontal timbers being marked or damaged, were the peculiarities of the occurrence.

[We are indebted to Mr. G. C. Bompas for the foregoing critical study of the effects of lightning by Mr. Rawlin Buckland, of the Eastern Extension Telegraph Company.—ED.]

EFFECTS OF FOG.

MR. WRIGHT sent to the Scientific Committee, Royal Horticultural Society, on November 7th, some vine leaves from Chiswick, to show the injurious effects of the recent fogs in the gardens of the Royal Horticultural Society. The Muscat class of grapes were most injured, the foliage being all scorched and the fruit more or less covered with a deposit. It was observed that the fog was remarkably early in the season. Prof. Church noticed that it was peculiarly pungent, causing a hundred buds of a Camelia to fall in a single day. Injury was also done to Orchids in Chelsea and Gunnersbury. The real cause of the injury is the presence of sulphurous acid gas, as well as the mechanical accumulation of sooty matters.—*Journal of Horticulture.*

REVIEWS.

The Altitude of the Aurora above the Earth's surface, by PROF. CLEVELAND ABBE. Reprint from *Terrestrial Magnetism*, Vol. III., 1898. Roy. 8vo. 68 pp.

WE have been reading with great interest the valuable papers which our able contemporary has had the privilege of publishing, and are glad to receive the above reprint.

All who desire to understand the formation of the beautiful phenomenon which we call aurora, must read and study the facts which Prof. Abbe has stated with clearness and precision. Taking in chronological order, all, or nearly all, who have dealt with the subject of the altitude of auroral appearances above the surface of the earth, he not merely points out their discrepancies but shows that their inconsistencies prove that there must be in the observations themselves some unconsidered source of error, as the observers have mostly been so competent that errors of observation cannot be accepted as the real explanation. Prof. Abbe does not (as far as we have seen) refer to the old theory that auroræ in temperate latitudes occur at a great height, and, as we approach the poles, at decreasing altitudes. He seems to confine himself to proving that the observations of those very persons who have deduced great altitudes afford internal evidence of their untrustworthiness, and to suggesting methods whereby all such observations can be tested; he accepts, as beyond dispute, the records of auroræ in arctic regions reaching almost to the ground, but we do not see any distinct expression of opinion as to the altitude in lower latitudes. Where so great an authority is silent, it is of course presumptuous for us to speak, but the impression left upon our mind is, that perhaps the altitude may not differ very widely from that of the mean snow line. Be that as it may, the paper is one which will give pleasure to all thoughtful readers.

Meteorological Observations taken at Kenilworth, Kimberley, during the year 1898, by J. R. SUTTON, B.A. [Excerpt, Report of the Cape Meteorological Commission]. Fcap. folio, 26 pages.

WE have, on one or two occasions, had the pleasure of printing letters from Mr. Sutton, but the above is the first annual report from him which we have seen. We congratulate him upon the splendid equipment which the De Beers Company has placed in his charge, and we thank these chiefs of the Diamond world for the valuable information which such instruments, under such a Superintendent, are supplying.

We have thus, in the centre of South Africa, in long. 24° 27′ E., and lat. 28° 42′ S., at an altitude of 3,950 ft., a meteorological observatory, certainly better equipped than Greenwich, and, having few, if any, equals in the British Isles. And the director is worthy

of the instruments, for though the present report is chiefly a statement of the results of the year's work, Mr. Sutton has dropped, on almost every page, hints which could, with advantage, be considered by meteorologists in the Old Country.

It would hardly be expected that a single year would give an accurate determination of the Diurnal Range of the Barometer—a datum much needed for the reduction of African observations. Here, however, are the Kimberley values :—

Midnight	+ ·006	6 a.m.	+ ·019	Noon	+ ·010	6 p.m.	— ·034
1 a.m.	+ ·003	7 ,,	+ ·031	1 p.m.	— ·011	7 ,,	— ·021
2 ,,	— ·001	8 ,,	+ ·040	2 ,,	— ·031	8 ,,	— ·007
3 ,,	— ·003	9 ,,	+ ·043	3 ,,	— ·041	9 ,,	+ ·002
4 ,,	·000	10 ,,	+ ·040	4 ,,	— ·046	10 ,,	+ ·008
5 ,,	+ ·007	11 ,,	+ ·029	5 ,,	— ·042	11 ,,	+ ·008

If these values are plotted, the resultant curve is one which will, we think, carry conviction as to its accuracy to all conversant with the subject.

Kimberley being so high (nearly 4,000 ft.) the air is generally dry, and rarely hot ; the absolute max. was 101°·0 on December 15th, and the min. 22°·2 on August 2nd, when the grass min. fell to 18°·4. The rainfall was about 18 in., and Mr. Sutton has returns from ten stations in the neighbourhood.

In conclusion, we may perhaps state one or two "wishes." We should like some illustrations, plan of the station, views of the instruments, map of the district showing the sites of the rain gauges, we also hope to hear that either the anemometer pole, or the evaporator, has been moved. The evaporation work is extremely important, but it must be carried on under perfect conditions.

Then will the best African station be even better than it is.

UNUSUAL SNOW CRYSTALS.

To the Editor of the Meteorological Magazine.

SIR,—Perhaps the substance of this note may be suited for admission to the pages of the *Meteorological Magazine.*

The morning of December 12th was in this locality ushered in by a considerable fall of snow (4½ inches), the first in the present season. The night of the 10th was very cold, the minimum in screen down to 20°. On the morning of the 11th a *few* flakes of snow fell, but the shape of the crystals was in my experience unusual—flat, opaque, six-pointed star-shaped figures having blunt rounded points, in size about 3–16ths of an inch in diameter.

It would be of some interest if your readers have ever traced any connexion between the two, *viz.*, a fall of snow 4 or 5 inches deep preceded within 24 hours by snow crystals of the above form.

Yours very truly,

WILLIAM L. W. EYRE.

Swarraton Rectory, Hants, December 12th, 1899.

KITES AND METEOROLOGY.

[WE much regret that the following note, received long since, from the inventor of the well-known "Eddy" Kite, has been accidentally buried. Although many of the facts mentioned have been recorded in our pages, some have not, and it will, we think, be convenient to have them in chronological order on Mr. Eddy's authority.—ED.]

1749. As far as I can find out, the first attempt to raise instruments into the air by means of kites was made by Wilson and Melvill, at Camlachie, near Glasgow, who sent up a thermometer in 1749.

1836. Admiral Bach, commanding the *Terror*, used a kite for the purpose of sending up a thermometer in Hudson Strait.

1837. The Franklin Kite Club of Philadelphia, Penn., used kites in a scientific way in 1837, and observed that approaching clouds caused vertical ascending air currents, as shewn by increased elevation of the kites.

1847. On September 14th, 1847, Birt, of Kew Observatory, used a kite to test temperature, humidity, wind velocity, &c.

1882. Archibald, of England, used kites in 1882, to support anemometers.

1891. On February 4th, 1891, at Bayonne, N.J., the writer sent to a height of 600 feet, a Hicks thermometer, sustained by kites. At the earth the temperature was 10° Fahrenheit, and aloft, 5°.

1891. Again, on February 14th, 1891, with the same thermometer, the temperature aloft was 28° Fahrenheit, and at the earth 30°. In the first observation, published in the *American Meteorological Journal*, July, 1891, a cold wave was sweeping in along the west, the earth not having cooled to the temperature of the upper air.

1894. On August 4th, 1894, at Blue Hill Observatory, the first ink recording thermograph was sent to a height of 1,400 feet, by means of five Eddy tailless kites.

1896. On October 8th, 1896, a meteorograph was raised to 9,375 feet above the sea level, or 8,744 feet above the summit of Blue Hill, by means of seven Eddy and two Hargrave kites. A fall of 26° Fahrenheit was recorded.

32, East 3rd Street, Bayonne, New Jersey, U.S.A. W. A. EDDY.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of this Society for the present session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair.

The undermentioned were elected Fellows of the Society:—S. Campbell-Bayard, Wallington, Surrey; John Chadwick, Bletchley, Bucks; Alfred Mander, Belle Vue Pharmacy, Malvern; C. H. Millard, 70, Market Street, Wigan; Ernest Oxley, Melbourne

Lodge, Clay Cross; Dr. G. C. Walker, Junior, 19, Preston Road, Southport; C. L. N. Wilson, Assoc. M.Inst.C.E., Western Villa, Bilston.

Mr. R. H. Curtis read a paper on "The Diurnal Variation of the Barometer in the British Isles." The principal features of a curve exhibiting the diurnal march of barometrical pressure are two minima and two maxima, the first minimum occurring early in the morning, and the second in the afternoon, while the first maximum falls in the forenoon, and the second not far from 10 o'clock in the evening. In the tropics the oscillation may amount to as much as 0·10 in., but its amplitude decreases as the latitude increases, and the greatest amplitude in the British Isles amounts to not much more than 0·03 in. The author discusses the mean hourly readings of the barometer from 25 years' observations, 1871-95, at four observatories maintained by the Meteorological Council, viz., Kew, Aberdeen, Falmouth, and Valencia. The author is of opinion that the primary cause of the diurnal oscillation of the barometer is solar radiation, and that its amplitude is chiefly determined by the temperature of the lower strata of the atmosphere. The relative magnitudes of the different phases of the barometer oscillation, as observed, depend largely upon the geographical position and physical surroundings of the place of observation, in so far as these are capable of modifying its temperature conditions, and especially the relative distribution of temperature over the regions immediately surrounding it.

Mr. G. J. Symons, F.R.S., gave the results of observations which he made during the hot weather in July, 1899, with two thermometers 1 ft. below the surface of the ground, with the view of ascertaining (1) the influence of slight shade; (2) the amount of daily range; and (3) the approximate curve of daily fluctuation at that depth.

* WONDERFUL STORY OF A THUNDERBOLT!

To the Editor of the Meteorological Magazine.

SIR,—As far as I can gather, the newspaper account was rather exaggerated, and compiled from hearsay evidence. I have seen Mrs. Atkin, and she seems very much confused as to what really did happen. Her account is that she was sitting at a table between the fireplace and the door—the fire was low and she rose to attend to it. As she was leaving the fire-place something came down the chimney, passed her, scorching the hair on one side of her head, and her eyebrow. There was immediately a loud explosion outside the house, followed by a large flash or flame at the roadside. That seems to be all. The fire in the grate was untouched. If anything came down the chimney it must have gone straight out of the door, exploding when outside, and leaving no trace of anything. That it lay on the road and "burned fiercely," was a myth, The woman was certainly scorched. The station-master saw her hair singed afterwards, and a blister followed between her eye and ear.

I hope that this may clear the matter up.—Yours truly,

The Vicarage, Deeping St. James, Nov. 20th, 1899. SAM W. SKENE.

* See *Met. Mag.*, November, 1899, p. 150.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

NOVEMBER.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	·53	8	·17	0	39·4	38·3	56·0	46·0	20·1	33·6	..	..	..	..	6·3
1859..	2·90	12	·68	0	41·9	40·0	59·2	48·0	24·3	36·4	..	..	..	..	5·7
1860..	2·72	13	·52	0	40·8	39·3	53·2	46·0	31·2	36·2	..	..	24·3	31·6	7·0
1861..	4·65	18	1·42	1	39·7	38·4	57·6	47·3	21·8	34·2	..	..	15·9	29·4	5·5
1862..	1·13	10	·51	0	39·6	38·5	56·9	43·9	23·7	34·4	..	..	17·2	29·7	6·1
1863..	1·84	13	·50	0	45·5	44·0	59·5	50·7	27·3	40·1	..	..	20·2	35·1	6·8
1864..	2·49	9	1·01	1	42·0	40·5	54·5	48·8	26·2	35·3	..	..	25·5	32·4	6·0
1865..	1·96	18	·38	0	44·6	42·9	57·0	50·6	31·2	40·0	..	..	26·5	35·8	5·4
1866..	1·73	14	·37	0	44·7	43·3	62·4	51·0	27·4	38·4	..	..	24·4	34·3	5·9
1867..	·86	4	·73	0	42·0	40·6	62·6	47·7	26·4	35·9	..	..	18·8	31·0	5·9
1868..	1·03	11	·39	0	41·7	40·1	59·3	47·2	25·4	36·5	..	..	22·2	33·8	7·2
1869..	2·38	14	1·03	1	43·3	41·4	58·2	49·1	27·6	37·4	..	..	..	(33·4)	6·1
1870..	1·76	13	·75	0	41·5	40·4	56·4	48·0	27·3	36·2	92·0	65·5	24·8	32·7	6·7
1871..	·60	8	·22	0	36·9	35·4	52·5	43·6	21·0	32·8	87·8	62·3	17·5	29·7	5·9
1872..	3·98	21	·65	0	45·1	43·5	61·2	50·9	31·7	40·2	90·0	70·1	28·2	37·4	6·4
1873..	1·87	14	·44	0	44·1	42·5	58·1	50·1	27·7	38·8	90·0	65·3	23·9	34·6	6·3
1874..	2·21	15	·90	0	41·8	40·6	60·0	47·4	25·6	36·9	89·2	62·1	24·8	34·6	6·5
1875..	3·36	20	·67	0	42·5	41·2	58·8	48·1	29·0	37·2	91·8	64·1	25·6	34·9	7·3
1876..	3·07	16	·46	0	43·6	42·5	61·4	49·7	27·6	38·8	90·6	66·8	24·1	35·7	7·1
1877..	3·88	22	·87	0	45·4	43·8	59·1	52·3	31·2	39·6	95·7	70·5	26·2	35·4	5·6
1878..	2·95	17	·51	0	39·5	38·1	53·5	44·9	29·4	34·8	87·0	61·2	24·6	31·9	7·1
1879..	·72	8	·27	0	38·3	36·8	55·2	44·1	23·0	34·4	84·7	63·7	17·8	30·1	6·0
1880..	1·85	13	·54	0	42·3	40·7	58·0	48·7	24·6	36·6	89·6	67·6	21·3	32·1	6·2
1881..	2·75	16	·55	0	48·9	47·2	62·5	54·2	31·9	43·3	95·2	70·2	27·2	38·5	7·4
1882..	2·57	18	·43	0	42·8	40·9	61·8	49·4	25·4	38·2	91·8	70·0	23·3	34·3	5·7
1883..	2·78	16	·40	0	43·4	41·7	55·8	49·9	28·7	37·2	82·0	65·7	20·3	32·6	6·5
1884..	1·92	12	·79	0	42·2	40·6	60·2	48·3	25·3	37·3	84·6	60·8	21·4	31·6	6·7
1885..	3·31	18	·68	0	43·3	42·0	58·7	48·5	28·3	38·6	82·2	57·7	17·8	33·7	7·3
1886..	2·71	14	·54	0	43·9	42·7	58·8	50·0	30·0	39·3	82·1	64·1	22·2	32·6	6·0
1887..	3·40	18	·60	0	40·6	39·2	55·4	45·7	22·1	36·4	89·9	59·3	18·7	32·6	7·3
1888..	4·38	20	·91	0	46·9	45·5	59·9	51·0	34·6	43·3	78·9	59·3	28·2	39·1	7·7
1889..	·89	8	·38	0	43·9	42·8	60·3	49·5	27·8	40·0	97·3	60·8	24·4	35·7	6·9
1890..	1·62	17	·34	0	42·8	41·4	58·1	48·8	20·8	37·4	87·5	62·9	17·8	32·3	6·7
1891..	1·98	18	·40	0	43·0	42·0	57·2	48·7	29·0	38·4	83·4	62·1	22·9	33·5	7·1
1892..	2·53	15	·77	0	45·0	44·0	60·8	50·2	30·8	40·6	86·8	58·6	25·6	36·2	7·8
1893..	2·16	15	·59	0	41·5	39·8	59·8	47·9	27·8	36·0	83·0	61·0	24·4	33·1	7·2
1894..	2·85	14	·66	0	45·8	44·4	63·9	52·0	31·3	41·5	98·1	67·0	26·1	37·3	6·2
1895..	3·17	19	·58	0	47·0	45·5	63·5	52·4	32·0	41·5	87·4	62·7	25·1	37·0	7·0
1896..	1·17	10	·43	0	40·0	38·5	50·3	46·0	25·4	34·9	80·1	59·3	19·1	29·2	6·0
1897..	1·05	14	·31	0	45·3	44·0	59·1	51·0	28·0	40·3	84·1	60·2	23·9	36·7	7·8
Mean ...	2·30	14	·58	0·1	42·8	41·4	58·4	48·7	27·2	37·7	88·0	63·6	22·8	33·7	6·6
Extremes	·53	4	·17	0	36·9	35·4	50·3	43·6	20·1	32·8	78·9	57·7	15·9	29·2	5·4
Extremes	4·65	22	1·42	1	48·9	47·2	63·9	54·2	34·6	43·3	98·1	70·5	28·2	39·1	7·8

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1899.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute.				Average.				Absolute.		Total Rain.		Aver.
	Maximum.		Minimum.										
	Temp.	Date.	Temp.	Date.	Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	87·1	5	42·3	15	75·5	52·1	49·4	64	134·6	37·0	1·49	6	4·7
Malta	87·7	11	58·8	1	79·7	65·1	61·7	73	151·6	52·9	·55	4	2·6
Cape of Good Hope	79·9	12	37·7	3	64·0	46·6	45·8	84	...	...	2·01	11	5·0
Mauritius	77·4	8	55·0	18	74·4	63·8	59·6	73	149·7	48·1	1·63	13	4·3
Calcutta	97·2	1	73·2	11	90·6	78·3	77·5	82	157·0	73·6	16·94	16	8·6
Bombay	92·0	8	74·7	16	86·7	78·9	76·2	80	137·5	73·8	20·81	22	7·9
Ceylon, Colombo	87·7	1*a*	73·0	4	86·0	76·5	72·9	79	140·0	67·0	9·23	24	6·6
Melbourne	63·8	20	34·6	18	56·0	43·1	44·5	86	116·7	28·1	3·04	15	6·0
Adelaide	66·5	19	37·8	17	59·5	47·3	45·0	76	129·0	29·0	3·04	19	6·3
Sydney	68·3	23	43·3	29	59·1	49·4	47·7	83	105·6	33·9	10·89	23	5·8
Wellington	59·0	13*b*	35·0	5	54·4	42·7	41·4	77	105·0	28·0	2·66	15	4·7
Auckland	63·0	1	39·0	25	59·2	48·2	44·0	69	112·0	32·0	4·76	14	6·0
Trinidad	95·0	6	68·0	Sev.	90·2	70·0	72·5	80	169·0	65·0	7·63	17	...
Grenada	87·0	5	69·8	11	84·1	75·1	68·9	70	150·2	...	6·14	17	3·1
Toronto	88·0	23	46·0	11	76·6	54·7	55·4	70	104·0	39·0	·66	8	3·7
New Brunswick, Fredericton	85·5	14	38·3	30	72·4	47·7	47·6	60	...	...	3·38	15	5·0
Manitoba, Winnipeg	83·8	30	30·0	8	74·3	50·7	...	75	...	...	3·68	15	6·3
British Columbia, Esquimalt	...	...	...	...	...	...	..	...	...	...	...	...	...

a—and 22. *b*—and 14.

REMARKS.

MALTA.—Adopted mean temp. 71°·1, or 0°·5 below average. Mean hourly velocity of wind 10·0 miles, or 1·3 above average. Mean temp. of sea 71°·7. TSS on 2nd, 3rd, and 4th. L on 19th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·9; of dew point 1°·0; and rainfall ·34 in., below their respective averages: mean hourly velocity of wind 10·2 miles, or 1·2 miles below average; extremes, 25·3 on 2nd and 29th, and 1·9 on 9th and 13th; prevailing directions, S.E. by E., and E.S.E. T on 6th. A. WALTER.

CEYLON, COLOMBO.—Mean temp. of air 80°·3, or 0°·7 below, of dew point 1°·2 below, and rainfall ·89 in. above, their respective averages. Mean hourly velocity of wind 10 miles; prevailing direction S.W. Max. velocity on 4th, at rate of 20 miles an hour, for 8 hours. Max. rainfall intensity 2·75 in. per hour for about 17 minutes on 4th. L on 3rd. TS on 4th. H. O. BARNARD.

Adelaide.—Mean temp. of air 0°·1, and rainfall ·25 in., above their respective averages for 42 years. Another good seasonable month, with good general rainfall over the whole of the colony. C. TODD, F.R.S.

Sydney.—Temp 0°·2 below; humidity 4·1 above; and rainfall 5·06 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—The weather during the month was unpleasant in consequence of the frequent, though not heavy, rains; the wind was variable and moderate, the temp. generally rather below the average; fogs occurred on 7 days. Mean temp. 0°·5 below, and rainfall 2·43 in. below, their respective averages. R. B. GORE.

Auckland.—Wet and disagreeable through the greater part of the month. Mean temp. and rainfall close to the average of 32 years. T. F. CHEESEMAN.

TRINIDAD.—Rain ·41 in. below the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	3·71	XI.	Builth, Abergwesyn Vic.	6·10
II.	Dorking, Abinger Hall .	5·62	,,	Rhayader, Nantgwillt ...	6·05
,,	Birchington, Thor	2·04	,,	Lake Vyrnwy	4·07
,,	Hailsham	4·59	,,	Corwen, Rhug	3·60
,,	Ryde, Thornbrough	5·19	,,	Criccieth, Talarvor	2·45
,,	Emsworth, Redlands ...	4·34	,,	I. of Anglesey, Lligwy..	3·55
,,	Alton, Ashdell	6·09	,,	I. of Man, Douglas	2·94
III.	Oxford, Magdalen Coll..	2·44	XII.	Stoneykirk, Ardwell Ho.	2·79
,,	Banbury, Bloxham	1·99	,,	New Galloway, Glenlee	10·26
,,	Northampton, Sedgebrook	1·71	,,	Moniaive, Maxwelton Ho.	8·11
,,	Stamford, Duddington..	...	,,	Lilliesleaf, Riddell	3·75
,,	Alconbury	2·00	XIII.	N. Esk Res. [Penicuick]	4·85
,,	Wisbech, Bank House...	1·93	XIV.	Glasgow, Queen's Park..	5·85
IV.	Southend	3·98	XV.	Inverary, Newtown	8·98
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	10·90
,,	Colchester, Lexden	3·31	,,	Islay, Gruinart School...	1·39
,,	Rendlesham Hall	2·23	XVI.	Dollar.....	4·33
,,	Scole Rectory	2·79	,,	Balquhidder, Stronvar...	13·73
,,	Swaffham	2·27	,,	Coupar Angus Station...	2·83
V.	Salisbury, Alderbury ...	3·47	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	3·14	XVII.	Keith H.R.S.....	1·68
,,	Blandford, Whatcombe .	5·36	,,	Forres H.R.S.	2·00
,,	Ashburton, Holne Vic...	5·05	XVIII.	Fearn, Lower Pitkerrie..	1·79
,,	Okehampton, Oaklands.	4·60	,,	S. Uist, Askernish	6·21
,,	Hartland Abbey	3·43	,,	Invergarry.....	13·07
,,	Lynton, Glenthorne ...	4·24	,,	Aviemore H.R.S.	4·75
,,	Probus, Lamellyn	2·77	,,	Loch Ness, Drumnadrochit	5·51
,,	Wellington, The Avenue	2·62	XIX.	Invershin	3·37
,,	North Cadbury Rectory	3·65	,,	Durness.....	7·62
VI.	Clifton, Pembroke Road	3·12	,,	Watten H.R.S.....	1·71
,,	Ross, The Graig	2·30	XX.	Dunmanway, Coolkelure	7·32
,,	Wem, Clive Vicarage ...	1·60	,,	Cork, Wellesley Terrace	2·75
,,	Wolverhampton, Tettenhall	1·49	,,	Killarney, Woodlawn ..	6·10
,,	Cheadle, The Heath Ho.	1·46	,,	Caher, Duneske	3·33
,,	Coventry, Priory Row ..	1·62	,,	Ballingarry, Hazelfort...	2·46
VII.	Grantham, Stainby	1·20	,,	Limerick, Kilcornan ...	1·29
,,	Horncastle, Bucknall ...	1·19	,,	Miltown Malbay	4·48
,,	Worksop, Hodsck Priory	1·21	XXI.	Gorey, Courtown House	2·83
VIII.	Neston, Hinderton	1·53	,,	Moynalty, Westland ...	3·31
,,	Southport, Hesketh Park	2·08	,,	Athlone, Twyford	3·98
,,	Chatburn, Middlewood.	3·05	,,	Mullingar, Belvedere ...	2·50
,,	Duddon Val., Seathwaite Vic.	10·70	XXII.	Woodlawn	3·21
IX.	Melmerby, Baldersby ...	1·85	,,	Crossmolina, Enniscoe ..	6·33
,,	Scarborough, Observat'y	...	,,	Collooney, Markree Obs.	4·78
,,	Middleton, Mickleton ...	2·72	,,	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	3·52	XXIII.	Warrenpoint.....	2·03
,,	Bamburgh	2·19	,,	Seaforde.....	4·41
,,	Keswick, The Bank	9·65	,,	Belfast, Springfield	3·62
XI.	Llanfrechfa Grange	4·81	,,	Bushmills, Dundarave..	2·47
,,	Llandovery	4·12	,,	Stewartstown	3·11
,,	Castle Malgwyn	4·72	,,	Killybegs	5·97
,,	Brecknock, The Barracks	4·67	,,	Horn Head	3·85

NOVEMBER, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which '01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	4·13	+ 1·47	1·36	3	10	61·8	2	29·9	30	3	6
II.		Tenterden	3·18	— ·21	·73	5	11	63·5	2	33·0	15*c*	0	12
,,		Hartley Wintney	4·30	...	1·38	3	10	60·0	10	26·0	30	4	6
III.		Hitchin	3·53	+ ·85	·89	5	13	61·0	2, 4	28·0	17	6	...
,,		Winslow (Addington)	2·69	— ·24	·77	3	10	61·0	2, 4	24·0	18*d*	5	6
IV.		Bury St. Edmunds (Westley)	2·91	+ ·36	·98	3	10	59·0	4	33·0	21	0	...
,,		Norwich (Brundall)	2·72	...	·74	5	12	61·0	10	31·6	18	1	10
V.		Winterbourne Steepleton ...	5·77	...	1·50	9	9	58·9	4	26·8	19	2	6
,,		Torquay (Cary Green)	4·54	...	1·02	9	9	59·3	4	33·9	19	0	2
,,		Polapit Tamar [Launceston]..	3·66	— ·68	·96	3	14	58·9	4	24·0	19	5	7
VI.		Stroud (Upfield)	2·63	— ·70	·81	3	12	61·0	4	28·0	18	...	...
,,		ChurchStretton(Woolstaston)	1·67	— 1·85	·44	3	13	58·5	2	30·0	19	1	3
,,		Worcester (Diglis Lock)	1·72	— 1·12	·57	3	11	...	...	...	...	...	...
VII.		Boston	1·08	— 1·12	·30	5	11	60·0	2, 4	25·0	19	5	...
,,		Hesley Hall [Tickhill].....	1·05	— ·97	·30	7	11	63·0	2	25·0	18	3	...
,,		Breadsall Priory	1·46	...	·38	7	8	...	...	25·0	18	2	...
VIII.		Manchester(PlymouthGrove)	1·58	— 1·42	·30	5	13	64·0	3	28·0	18*d*	3	4
IX.		Wetherby (Ribston Hall) ...	1·44	— ·63	·39	11	11	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·53	— 1·22	·95	7	17	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·20	— ·81	·45	7	7	62·0	2, 5	27·0	18*d*	3	6
X.		Newcastle (Town Moor)	1·19	— 1·21	·23	9	12	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	15·95	+ 1·16	2·65	4	24	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·84	— 2·07	·85	3	13	...	...	...	...	...	...
,,		Haverfordwest	3·40	— 2·46	·86	7	13	59·7	5	34·0	18	0	4
,,		Aberystwith (Gogerddan) ...	2·97	— 2·14	·83	7	11	63·0	9	...	...	...	4
,,		Llandudno.....	2·34	— ·75	·55	3	14	...	...	...	...	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	6·42	+ 1·86	1·13	2	12	57·0	5	27·0	18	2	...
XIII.		Edinburgh (Blacket Place)...	3·26	...	1·01	3	16	59·3	2	33·5	18	0	3
XIV.		Colmonell	5·99	...	1·23	3	17	59·0	11*a*	30·0	17	...	...
XV.		Tighnabruaich	5·23	...	·95	3	21	54·0	4	33·0	17	0	...
,,		Mull (Quinish).....	6·13	— ·86	·61	10	25	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·00	+ ·04	1·10	4	14	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	2·50	— ·20	·50	3, 9	16	57·8	2	29·0	16	2	...
XVII.		Braemar	6·70	+ 2·12	2·10	7	20	56·8	4	12·2	16	6	14
,,		Aberdeen (Cranford)	1·35	...	·21	10	16	58·0	23*b*	29·0	14*e*	5	...
,,		Cawdor (Budgate)	2·83	— ·02	·88	3	19	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	6·00	— ·56	·89	9	14	...	...	...	...	...	...
,,		Glencarron Lodge.....	16·79	...	...	...	28	60·9	4	29·4	15	2	...
XIX.		Dunrobin	2·52	— ·31	·58	3	21	57·0	8	32·0	15	1	...
,,		S. Ronaldshay (Roeberry) ...	3·36	— ·06	·46	19	21	55·0	4	35·0	19*f*	0	...
XX.	IRELAND.	Darrynane Abbey.....	2·51	...	·83	2	15	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·86	— ·81	·62	7	11	58·0	4	40·0	4*g*	0	...
,,		Broadford (Hurdlestown) ...	2·65	...	·59	2	15	..	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·40	— ·66	1·39	7	13	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·96	— ·87	·39	3	13	64·9	4	38·1	18	0	2
XII.		Ballinasloe	3·66	— ·25	·84	2	18	58·0	4	29·0	19	3	...
,,		Clifden (Kylemore)	8·93	+ 4·72	1·17	2	18	...	...	...	...	..	...
XIII		Waringstown	3·00	— ·10	·92	3	8	57·0	18	34·0	21	0	2
,,		Londonderry (Creggan Res.).	3·27	— 1·25	·52	3	20	...	...	...	...	...	...
,,		*Omagh* (Edenfel)	3·04	— ·83	·47	3	18	60·0	4	31·0	18	1	3

+ Shows that the fall was above the average; — that it was below it.

a—and 17. *b*—and 24, 27. *c*—and 20, 30. *d*—and 19. *e*—and 15. *f*—and 24. *g*—and 12, 18, 19, 27, 29.

METEOROLOGICAL NOTES ON NOVEMBER, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LONDON, CAMDEN SQUARE.—A remarkable November. With a total rainfall 79 per cent. above the average, and only twice exceeded in 40 years, there was absolute drought for 19 days; the longest on record in November. The mean temp. (47°·7) is 4°·7 above the average, and has been exceeded in November only in 1881. The temp. rose above 50° on 24 days (a number exceeded only in 1881), and above 60° on 3 days.

TENTERDEN.—Very wet from 2nd to 9th, but absolute drought for 16 days from 15th to 30th, with scarcely any sunshine. The gales, so common at the end of November, were conspicuous by their absence. Duration of sunshine, 64 hours. L on 8th.

HARTLEY WINTNEY.—The whole of the R fell in the first 10 days, the remaining 20 being very fine and dry, though dull, with extremely light S.W. winds. Dahlias, roses, verbenas, and geraniums were in flower until cut down by frost on 30th. Ozone was registered on 13 days, mean 4. L on 5th, 6th, 7th, and 10th. Fog on 17th, 18th, 19th, and 30th.

WINSLOW, ADDINGTON.—The first part of the month was wet and stormy, but not a drop of R fell after the 11th. There was a good deal of fog at times, very dense on the night of the 19th, ·01 in. of water being deposited in the rain gauge.

BURY ST. EDMUNDS, WESTLEY.—The mildest November for many years. Till the 9th, very wet, then very fine and dry to the end. T on 2nd, 6th, and 11th.

NORWICH, BRUNDALL.—The mildest November since the record commenced in 1886; rainy during the first week, afterwards dry. Dahlias in bloom in the open at the close. L on 8th. T L and H on 11th.

WINTERBOURNE STEEPLETON.—The earlier part of the month was very wet, and it followed a wet week, the rainfall for the 18 days ending 11th being 7·54 in. After that date no R fell. The temp. was high (mean 47°·8) and there was very little frost.

TORQUAY, CARY GREEN.—Rainfall ·62 in. above the average. Mean temp. (50°·8), 3°·5 above the average. Duration of sunshine 64 hours 40 minutes, being 4 hours above the average; 10 sunless days.

POLAPIT TAMAR [LAUNCESTON].—The first 10 days were wet and stormy; the remainder of the month was remarkable for general calm and absence of strong wind, the average daily velocity for the last 20 days being only 34·5 miles, while for the whole month it is 121·8 miles. T and L on 8th. Thick fog till 11 a.m. on 19th.

CHURCH STRETTON, WOOLSTASTON.—The early part of the month was wild and stormy, with heavy gales on 3rd, 7th, 8th, and 9th, but scarcely any R fell after the 11th. T and L on 8th. Fog on 14th and 15th. Mean temp. 47°·0.

WALES.

HAVERFORDWEST.—The month was unusually fine and mild, with temp. above the average, but very little sunshine. From the 1st to the 10th the weather was wet and stormy, but from that date to the end every day was fine, a little R falling in the night. Springs still somewhat low. L on 2nd and 7th.

ABERYSTWITH, GOGERDDAN.—Very mild throughout the month.

LLANDUDNO.—T and L at night on 2nd. S on the hills on 11th.

SCOTLAND.

CARDEN [DUMFRIES].—November opened with a spell of wet, boisterous weather, which continued until the 11th, when exceptionally fine weather set in, and lasted during the remainder. The mildness of the temp. was remarkable, the mean being the highest recorded in 40 years, and there was almost entire absence of frost. The warmth of the last 7 days was remarkable; the mean temp. being 50°·5, while the min. exceeded 50° on 3 nights, and averaged 48°·7. In the first 7 days 4·25 in. of R fell, while on 2nd, 3rd, and 7th, the fall exceeded an inch. Southerly winds prevailed on 21 days, and S. gales occurred on 4th, 7th, and 8th. Sunshine was much below the average, 5 days being sunless. T on 3rd and 4th.

EDINBURGH, BLACKET PLACE.—A remarkably mild month, with no frost, the mean temp. (47°·4) being 6°·5 in excess of the average of 135 years, and the highest in the period 1764 to 1899. The temp. rose above 50° on 23 days. Rainfall 29 per cent. above the normal. Gale with H and R on 3rd. Gale and heavy squalls on 7th.

COLMONELL.—Rainfall ·85 in. more than the average of 23 years. Mean temp. (48°·6) 7°·5 above the average. Between 7.30 a.m. and 3 p.m. on 1 1·69 in. of R fell. Gales on 5 days. H on 11th.

TIGHNABRUAICH, CRAIGANDARAICH.—A wet and windy month, with high temp. Mean 45°·2.

MULL, QUINISH.—T, L and H showers on 5th.

BRAEMAR.—A fine open month, notwithstanding a heavy rainfall. Hurricane and L on 12th.

ABERDEEN, CRANFORD.—A fine and very warm November, the temp. rising to 58° on several days.

S. RONALDSHAY, ROSEBERY.—An unsettled and windy month. The latter part very mild. Mean temp. 46°·5, or 3°·5 above the average of 9 Novembers.

IRELAND.

DARTRYAN ABBEY.—A dry month on the whole. From 1st to 10th 2·14 in. of R fell, and these 10 days were very wild and stormy. The rest of the month was very fine and warm, and many days were quite spring-like. A severe TS occurred between 8 p.m. and 8.30 p.m., on 7th.

WATERFORD, BROOK LODGE.—A heavy gale, blowing down trees, and showers, occurred on 3rd, a heavy S.W. gale on 7th, and T and L at night. The latter half of the month was very mild and calm.

BROADFORD, ETTERLESTOWN.—A very fine November. Rainfall ·64 in., on rainy days 5, less than the average of 15 years. T on 5th, T and L on 8th.

DUBLIN, FITZWILLIAM SQUARE.—A record month for warmth, the mean temp. being 50°·7, compared with 50°·3 in November, 1882, and an average of 44°·7. The first half of the month was very stormy, wet, and generally unsettled, and on 3rd a tempest of wind and R swept over, doing much damage to trees and buildings. During the second half high pressure prevailed, with cloudy skies. High winds occurred on 16 days, and gales on 7. H fell on 8th and 11th. L was seen on 7th, 8th, 9th, and 14th.

BALLINASLOE.—L on 5th and 10th. W. gales on 10th and 11th.

EDGEWORTH [OMAGH].—The weather of the first 10 days was very mild, and very wet, nearly all the R of the month having fallen within that period, but for the remainder, calm, often clear, abnormally mild, and comparatively rainless weather, made November remarkable.

No. CCCCVIII.] [PRICE FOURPENCE.
VOL. XXXIV. *Or 5s. per annum post free.*

THE NEW YORK PUBLIC LIBRARY

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
Low Barometric Pressure on December 29th, 1899	177
Royal Meteorological Society	178
REVIEWS :—	
Sur les ascensions dans l'atmosphère d'enregistreurs météorologique portés par des cerfs-volants	180
Sur la température et ses variations dans l'atmosphère libre, d'après les observations de quatre-vingt-dix ballons-sondes	180
Severe Frost in December, 1899	181
Results of Meteorological Observations at Camden Square during December for 40 Years, 1858–97	183
Climatological Table for the British Empire, July, 1899	184
Supplementary Table of Rainfall, December, 1899	185
Rainfall and Temperature in December, 1899, at 50 Stations ...	186
Meteorological Notes on December, 1899	187

JANUARY, 1900.

LONDON:
EDWARD STANFORD, 26 & 27, COCKSPUR STREET, S.W.

ABERYSTWITH, GOGERDDAN.—Very mild throughout the month.

LLANDUDNO.—T and L at night on 2nd. S on the hills on 11th.

SCOTLAND.

CARGEN [DUMFRIES].—November opened with a spell of wet, boisterous weather, which continued until the 11th, when exceptionally fine weather set in, and lasted during the remainder. The mildness of the temp. was remarkable, the mean being the highest recorded in 40 years, and there was almost entire absence of frost. The warmth of the last 7 days was remarkable; the mean temp. being 50°·5, while the min. exceeded 50° on 3 nights, and averaged 48°·7. In the first 7 days 4·25 in. of R fell, while on 2nd, 3rd, and 7th, the fall exceeded an inch. Southerly winds prevailed on 21 days, and S. gales occurred on 4th, 7th, and 8th. Sunshine was much below the average, 15 days being sunless. T on 3rd and 4th.

EDINBURGH, BLACKET PLACE.—A remarkably mild month, with no frost, the mean temp. (47°·4) being 6°·5 in excess of the average of 135 years, and the highest in the period 1764 to 1899. The temp. rose above 50° on 23 days. Rainfall 20 per cent. above the normal. Gale with H and R on 3rd. Gale and heavy squalls on 7th.

COLMONELL.—Rainfall ·85 in. more than the average of 23 years. Mean temp. (48°·6) 7°·5 above the average. Between 7.30 a.m. and 3 p.m. on 3rd 1·69 in. of R fell. Gales on 5 days. H on 11th.

TIGHNABRUAICH, CRAIGANDARAICH.—A wet and windy month, with high temp. Mean 45°·2.

MULL, QUINISH.—T, L and H showers on 5th.

BRAEMAR.—A fine open month, notwithstanding a heavy rainfall. Hurricane and L on 12th.

ABERDEEN, CRANFORD.—A fine and very warm November, the temp. rising to 58° on several days.

S. RONALDSHAY, ROEBERRY.—An unsettled and windy month. The latter part very mild. Mean temp. 46°·5, or 3°·5 above the average of 9 Novembers.

IRELAND.

DARRYNANE ABBEY.—A dry month on the whole. From 1st to 10th, 2·14 in. of R fell, and these 10 days were very wild and stormy. The rest of the month was very fine and warm, and many days were quite spring-like. A severe TS occurred between 8 p.m. and 8.30 p.m., on 7th.

WATERFORD, BROOK LODGE.—A heavy gale, blowing down trees, and H showers, occurred on 3rd, a heavy S.W. gale on 7th, and T and L at night. The latter half of the month was very mild and calm.

BROADFORD, HURDLESTOWN.—A very fine November. Rainfall ·64 in., and rainy days 5, less than the average of 15 years. T on 5th, T and L on 8th.

DUBLIN, FITZWILLIAM SQUARE.—A record month for warmth, the mean temp. being 50°·7, compared with 50°·3 in November, 1881, and an average of 44°·7. The first half of the month was very stormy, wet, and generally unsettled, and on 3rd a tempest of wind and R swept over, doing much damage to trees and buildings. During the second half high pressure prevailed, with cloudy skies. High winds occurred on 16 days, and gales on 7. H fell on 8th and 11th. L was seen on 7th, 8th, 9th, and 14th.

BALLINASLOE.—L on 5th and 10th. W. gales on 10th and 11th.

EDENFEL [OMAGH].—The weather of the first 10 days was very mild, and very wet, nearly all the R of the month having fallen within that period, but for the remainder, calm, often clear, abnormally mild, and comparatively rainless weather, made November remarkable.

CCCVIII.]
XXXIV.

[PRICE FOURPENCE.
Or 5s. per annum post free.

NEW YORK PUBLIC LIBRARY

SYMONS'S MONTHLY METEOROLOGICAL MAGAZINE.

CONTENTS.

	PAGE.
Low Barometric Pressure on December 29th, 1899	177
Royal Meteorological Society	178
Reviews :—	
Sur les ascensions dans l'atmosphère d'enregistreurs météorologique portés par des cerfs-volants	180
Sur la température et ses variations dans l'atmosphère libre, d'après les observations de quatre-vingt-dix ballons-sondes	180
Severe Frost in December, 1899	181
Results of Meteorological Observations at Camden Square during December for 40 Years, 1858–97	183
Climatological Table for the British Empire, July, 1899	184
Supplementary Table of Rainfall, December, 1899	185
Rainfall and Temperature in December, 1899, at 50 Stations ...	186
Meteorological Notes on December, 1899	187

JANUARY, 1900.

LONDON:

EDWARD STANFORD, 26 & 27, COCKSPUR STREET, S.W.

LONDON: G. SHIELD, PRINTER, LANCELOT PLACE, BROMPTON ROAD, S.W.

THE OBSERVATORY:

A Monthly Review of Astronomy.

EDITED BY H. H. TURNER, M.A., B.Sc., SEC. R.A.S.
(Savilian Professor of Astronomy,)
T. LEWIS, F.R.A.S., AND H. P. HOLLIS, B.A., F.R.A.S.

Contains full Reports of the Meetings of the Royal Astronomical and Ro
Meteorological Societies, and of the British Astronomical Association; Artic
by various eminent Astronomers, English, American, and Continent
Correspondence on topics of interest connected with the Science; Notices
Observatories, Publications and current Discoveries. Notes on Meteors,
Variable Stars, on Lunar Formations, etc., also are supplied for the assista
and direction of observers.

The Observatory was founded in 1877, and has become an established and very valua
publication.—*Prof. Young, in "Ten Years' progress in Astronomy."*

All communications should be addressed to the Editors of "The Observatory"
Royal Observatory, Greenwich, S.E.

Annual Subscription (for the "Companion" and twelve Monthly Numbers), 9s.

NOTICES.

It is requested that all Books for Review, and Communications f
the Editor be addressed to 62, Camden Square, London, N.W.

The responsibility for all facts and opinions expressed in t
letters published in this Magazine rests with their respective authors.

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS.

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCCVIII.] JANUARY, 1900. [PRICE FOURPENCE, or 5s. per ann. post free.

LOW BAROMETRIC PRESSURE ON DECEMBER 29TH, 1899.

WE do not intend to give a complete or an exhaustive note upon the above subject—but merely to place upon record the principal facts which have been reported to us. The responsibility as to accuracy must rest with the authors, except that where they have not corrected their readings for altitude we have done so approximately, and given the equivalents in [ ].

Camden Square, London.—Min. S.L. pressure 28·427 in. at 5 p.m.; the only lower pressures since 1858 have been: 1872, January 24th, 4.47 a.m., 28·332 in.; 1876, December 4th, 11 a.m., 28·364 in.; and 1886, December 9th, 4.45 a.m., 28·295 in. G. J. SYMONS.

Edith Road, Kensington.—Min. S.L. pressure 28·420 in. G. VON U. SEARLE.

Speldhurst, Tunbridge Wells.—Min. bar. 28·30 in. [S.L. = ? 28·46 in.] E. W. WINTON.

Worthing.—Min. S.L. pressure 28·526 in., at 4.30 p.m. C. KELLY, M.D.

Crowborough.—At 7 p.m. bar. only 27·805 in. [S.L. = ? 28·51 in.]. J. J. S. DRIBERG.

Kempsey, Bournemouth.—Min. S.L. pressure 28·49 in. at 3.15 p.m. E. L. M. COLVILE.

West Dean, Hants.—Min. S.L. pressure 28·389 in. E. WELLS.

Redheath, Rickmansworth.—Min. by open scale glycerine bar. 28·325 in., at 6.30 p.m., at 285 ft. above sea level. W. NEWALL.

Upton, Slough.—Min. by open scale glycerine bar. 28·23 in., at 5.30 p.m., at 97 ft. above sea level. RICHARD BENTLEY.

St. Giles, Oxford.—Bar. 28·35 in. at 9 p.m., lowest since December 8th, 1886. Miss E. M. TAWNEY.

Writtle, Chelmsford.—The record of a Richard barograph gave a min. of 28·45 in., at 6.30 p.m. Miss USBORNE.

Brundall, Norwich.—Bar. 28·50 in., at 7 p.m. A. W. PRESTON.

Statsford, Whitchurch, Tavistock.—Min. S.L. pressure 28·271 in., at 1.40 p.m. E. E. GLYDE.

North Cadbury.—Bar. lowest between 3.30 and 4 p.m. Aneroid read 28·34 in. H. A. BOYS.

Orchardleigh, Frome.—My two aneroids both reached their lowest point (27·80 and 28·20 in.) at 11 a.m. They then rose a little and fell again, but not so low as at 11 a.m. W. A. DUCKWORTH.

Hampton Lodge, Bristol.—At 8 p.m. the bar. read 27·97 in. [S.L. = ? 28·16 in.], at 11 p.m. it had risen 0·43 in. J. H. DIX.

The Graig, Ross.—Min. S.L. pressure 28·285 in., at 5.40 p.m.; the only lower pressures since 1871 have been, 1872, January 24th, 3.45 a.m., 28·283 in.; and 1876, December 4th, 8.50 a.m., 28·232 in. H. SOUTHALL.

Underdown, Ledbury.—Lowest observed reading, 8 p.m., 28·096 in. [S.L. = 28·336 in.] SPENCER H. BICKHAM.

Highfield, Shrewsbury.—The record of a Richard barograph gives a min. of 28·60 in., at 6 p.m. T. M. HOWELLS.

The Firs, Bentley Heath, Knowle, Warwickshire.—Min., by Negretti standard, Kew verified, 27·914 in., at 6 p.m., giving S.L. pressure of 28·303 in. F. W. NASH.

Hodsock Priory, Worksop.—Min. S.L. pressure 28·362 in., at 9 p.m. H. MELLISH.

Queen's Park, Bolton.—Min. S.L. pressure 28·38 in., at 9 p.m. Lowest since 8th December, 1886. W. W. MIDGLEY.

Downham Hall, Clitheroe.—The record of a Richard barograph gave min. of 28·10 in., at 8 p.m. RALPH ASSHETON.

Llandefaelogfach, Brecon.—Bar. fell to 27·80 in., unprecedented here. W. WILLIAMS.

Douglas, Isle of Man.—Min. bar. 28·33 in., at 2 p.m. H. STORY.

Riddell, Lilliesleaf, N.B.—Min. bar. 28·05 in., in afternoon. No gale. J. SPROT (Gen.)

Blacket Place, Edinburgh.—Min. pressure 28·456 in., at 9 p.m. R. C. MOSSMAN.

Longraigue, New Ross, Wexford.—Min. at 6 p.m., 27·96 in. [S.L. = ? 28·10 in.], 0·22 in. lower than previously observed. J. W. DEANE.

Ban-aboo, Ardcolm, Wexford.—Min. bar. 28·18 in. [S.L. = ? 28·11 in.] J. MAGRATH (Col.).

Fitzwilliam Square, Dublin.—Min. of bar. 28·33 in. J. W. MOORE, M.D.

The above notes appear to agree very well with the remarkable path of the depression shown on the *Daily Weather Report* of the Met. Office—viz.: first an easterly track along the south of Ireland, and then a sudden change to a northerly one over the Isle of Man. The min. seems to have been about 28·1 inches, and the time of progress that shown by the D.W.R.,—some of the record times are inconsistent, because the curve was so flat that it was difficult to determine precisely when the min. occurred.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 20th, at the Institution of Civil Engineers, Mr. F. C. Bayard, LL.M., President, in the chair. The following candidates were duly elected Fellows:—A. F. Beaufort, c/o W. M.

Beaufort, 18, Piccadilly, W.; H. S. Burbery, Trent House, Cowes, Isle of Wight; C. J. P. Cave, Binsted, Cambridge; R. Cheyne, D.P.H., Edgefield, York Road, West Norwood; E. Henshall, Assoc.M.Inst. C.E., Woolacombe, N. Devon; H. Heywood, J.P., Witla Court, Cardiff; D. McDouall, Logan, Stranraer, Wigtonshire; H. C. L. Morris, M.D., Gothic Cottage, Bognor; H. V. Prigg, Assoc.M.Inst. C.E., 63, Craven Avenue, Plymouth; Lt.-General J. Sprot, Riddell, Lilliesleaf, Roxburghshire; F. Taylor, J.P., Ash Lawn, Heaton, Bolton; W. K. Wilkinson, jun., Middlewood, Clitheroe; A. Wilson, 4, Eaton Road, Ilkley.

The Climatic Conditions necessary for the Propagation and Spread of Plague.

By Mr. Baldwin Latham, C.E.

The author said that the bubonic plague was primarily due to a specific organism or microbe of infinitesimal size, so small that probably 250 millions of them would be required to cover a square inch of surface. Plague was infectious and contagious, and was greatly influenced by pestilential emanations from polluted and waterlogged soils. Plague was undoubtedly a disease of the poor, and most readily attacked those living on a low diet. The conditions which were conducive to the spread of plague were identical with those which gave rise to the escape of malaria from the ground. That the ground itself exercised an enormous influence upon plague was shown by the fact that, in all the epidemics, persons living on the ground floors suffered much more than those who lived in the higher storeys. If the temperature of the air increased beyond the temperature of the ground, so that its dew point was above the temperature of the ground, condensation instead of evaporation took place. To this increased high temperature might be due the sudden stoppage of plague after a certain high temperature had been reached. A sudden fall of temperature caused plague to arise; for, a fall of temperature meant that the temperature of the dew point must fall, and the tensional difference between a low dew point and a high ground temperature would at once lead to exhalations escaping in large quantities from the ground, leading to the liberation of the plague bacillus from the ground, accompanied with the exhalations necessary for its development.

Another paper on a remarkable dust haze which was experienced at Teneriffe, Canary Islands, on February 16th to 19th, 1898, was communicated by Dr. R. H. Scott, F.R.S. The haze during this period was so exceptionally dense that a steamer was two days and three nights on a voyage from Teneriffe to Las Palmas, a distance she usually covered in five hours. The Tintagel Castle, of the Donald Currie Line, was delayed for 30 hours, and the Roslin Castle, homeward bound, had the dust so thick that for 900 miles the sun and stars were obscured, and the ship was delayed two days.

REVIEWS.

Sur les ascensions dans l'atmosphère d'enregistreurs météorologiques portés par des cerfs-volants.

Sur la température et ses variations dans l'atmosphère libre, d'après les observations de quatre-vingt-dix ballons-sondes. Par M. LÉON TEISSERENC DE BORT. Excerpts Comptes Rendus de l'Académie des Sciences. Paris, Gauthier-Villars, 1899. 4to, 4 and 2 pp.

M. L. TEISSERENC DE BORT is doing splendid work at his observatory at Trappes, and showing for the old world, as Mr. Rotch is showing for the new world, that in original research amateurs can beat State-subsidized establishments.

These two short papers indicate an amount of work and of expenditure, of which the author says nothing, but for which he ought to receive the hearty thanks of meteorologists of all countries.

The first paper opens with a recognition of Mr. Rotch's work at Blue Hill, it then states that similar work was started at Trappes in 1897, that 2,000 metres (6,562 ft.) was reached several times in 1898, and that in 1899 the following heights were reached :—

1899.	June 14th,	3,940 metres, or 19,927 ft., or 3¾ miles.	
,,	,, 15th,	3,590 ,,	,, 11,778 ft., ,, 2½ ,,
,,	July 3rd,	+3,300 ,,	,, over 10,827 ft., or 2 miles.

Experiments at Trappes on more than 100 days show that the decrease of temperature with height is very different in cyclones and in anti-cyclones. In the former the decrease is rapid; in the latter, soon after reaching 500 or 1,000 ft., the decrease becomes slow, and sometimes even an increase takes place.

As regards wind systems it appears—

(i.) With low pressure and an overcast sky, the velocity of the wind increases with height, especially in the neighbourhood of the lower cloud stratum.

(ii.) On the contrary, in fine weather, with high barometric pressure, the velocity of the wind decreases with height up to an altitude of between 1,500 and 2,000 metres (4,921 to 6,562 ft.).

The second paper deals with the results obtained by *ballons-sondes*, *i.e.*, small balloons carrying self-recording instruments but no passengers.

These are expensive, because there is not only risk of loss of the balloon, but also of breakage of the beautiful recording instruments. Our readers will therefore realize what M. L. Teisserenc de Bort is doing, when we mention that this paper contains the results of more than 100 such ascents.

We had not thought of it, but are glad to state upon the author's authority that *ballons-sondes* were started first by the French, in 1894.

In these pages we have always urged that kite work and balloon work should go on side by side, and we are glad to find that

experimenters are adopting our view, and using kites for the first mile or two of vertical height, and *ballons-sondes* for greater heights. One of the Trappes balloons reached 13,000 metres, or about 8 miles.

Systematic balloon work began at Trappes in April, 1898, and has been continued monthly (sometimes repeated at short intervals) ever since. In the present note M. Teisserenc de Bort epitomizes the results of the temperature observations in the following two paragraphs :—

(i.) The temperature at various altitudes at various seasons varies much more than old observations with passenger balloons had led us to expect.

(ii.) Apparently, even up to the altitude of 10 kilometres (6 miles) there is a tendency to a marked seasonal variation of temperature, with a maximum at the end of summer, and a minimum at the end of winter.

SEVERE FROST IN DECEMBER, 1899.

Two letters appeared in the *Hereford Times*, and one supported the other so remarkably that we have had to examine the facts. The following are the letters :—

A RECORD IN TEMPERATURE.

To the Editor of the Hereford Times.

SIR,—It may interest your readers to know the thermometer readings—constituting a record almost, I should think—outside this house, 750 feet above sea, and in a place sheltered from the North and East.

15th December, 1899, at 9.30 a.m. temperature was five degrees above zero.

FULLARTON JAMES.

Chief Constable's House, Pen-y-bont, Radnorshire, Dec. 20th, 1899.

LOW TEMPERATURE IN THE WYE VALLEY.

SIR,—The sudden falling of the temperature during the past week has been unusual indeed. On the morning of the 15th inst. Negretti and Zambra's thermometer, enclosed in a meteorological screen (Stevenson's pattern), and then put above the ground registered nearly 34° of frost.

As far as I can recollect this is the lowest reading we have had since the 16th January, 1879, when the instrument referred to indicated 36° of frost, or 4° below zero.

P. MACCABE.

Rotherwas Gardens, Hereford, December 21st, 1899.

As regards these stations there is nothing to show that the thermometers were perfect and in good order; and inspectors alone know how often spirit minimum thermometers read too low, because of the evaporation of the spirit and its condensation as a colourless liquid at the top of the tube. At Pen-y-bont it was apparently a wall exposure, and at Rotherwas the expression respecting the Stevenson hardly suggests that it was, at it should be, 4 ft. above the ground. However, the figures are +5° F. and —2° F., whereas in other parts of the country there are many stations at which the temperature did not fall so low by 20°.

We have taken out all the December shade minima which we have received, and which were below 15°, and give them in the following table :—

Shade Minima below 15° *in December*, 1899.

Chiddingfold, Surrey ...	13°	on 14th	Hemingby, Lincoln	6·8	on 12th
Fair Hall, Lewes	13	,, 16th	Hodsock Priory, Worksop	6·4	,, 14th
Hartley Wintney, Hants	12	,, 14th	Hesley Hall, Notts	10	,, 14th
Welford Park, Newbury	9	,, 16th	Goldsborough Hall, York	4	,, 16th
Compton, Berks.....	3	,, 14th	Driffield, ,,	10	,, 16th
Addington, Bucks.....	11	,, 16th	Malton, Yorks	10°	on 12th & 15th
Swerford, Oxford	12	,, 16th	Thirsk, ,, ...	14	on 15th
Castle Ashby, Northants	13	,, 16th	Unthank Hall, Northumbd	12	,, 14th
Sedgebrook, ,,	12	,, 16th	Appleby, Westmoreland.	9·8	,, 15th
Rendlesham Hall, Suffolk	9	,, 12th	Llanvihangel Court, Mon.	10	,, 15th
Brundall, Norwich	13	,, 16th	Llandovery, Carmarthen.	13	,, 15th
North Cadbury, Somerset	14·5	,, 15th	Gogerddan, Aberystwith	11	,, 14th
Further Barton, Cirenc'st'r	10	,, 16th	Llandefaelog-fach, Brecon	10	,, 15th
The Graig, Ross, Hereford	9·4	,, 15th	Abergwesyn, ,,	3	,, 14th
Leominster, ,,	4	,, 15th	Riddell, Lilliesleaf, N.B.	9	,, 13th
Clunbury, Shropshire ...	0	,, 15th	Leith, Edinburgh	12	,, 14th
Woolstaston, ,, ...	14·5	,, 14th	Stronvar, Perth	7	,, 14th
The Clive Vic. ,, ...	7·5	,, 14th	Cupar Angus, Perth	3	,, 15th
Wrottesley, Wolverhmptn	13·8		E. Necropolis, Dundee...	14·9	,, 15th
Priory Row, Coventry ...	10	,, 16th	Braemar, Aberdeen	8·2	,, 15th
Loughborough	8	,, 14th	Cranford, ,, ...	10	,, 14th

From these we conclude (1) that there is no proof that the record of —2° F. near Hereford is wrong, although it seems improbable; (2) that the cold was felt in patches; (3) that it would be well when the next snow comes, to fill flower pots with it, and to bury all the thermometers in the snow packed closely round their bulbs, and to notice what they read. When the snow is just melting and running through the hole at the bottom of the pot, they ought to show 32°. It will be interesting to hear how many of them do so.

To the Editor of the Meteorological Magazine.

SIR,—The following phenomenon may be considered interesting enough for insertion in the *Met. Mag.*

During the recent cold weather some of us on the golf links opened for lunch two or three soda water bottles which had been kept in a cold place. To our astonishment they all *instantly* froze, so that we could only get out a small quantity of the water. Previous to being opened they were perfectly fluid and free from ice. Evidently the temperature was such that, though when closed the pressure of the gas kept them from freezing, on the removal of the pressure they congealed at once. The effect was very startling and curious. No doubt anyone wishing to perform the experiment could do so by leaving a bottle out in the shade on a very cold day till it was some degrees below freezing and then suddenly opening it. The instantaneousness of the result is, of course, the most noticeable feature.—Yours truly,

T. B. BLATHWAYT.

Lyme Regis, Dorset, Dec. 18th, 1899.

RESULTS OF METEOROLOGICAL OBSERVATIONS AT CAMDEN SQUARE FOR 40 YEARS, 1858–97.

DECEMBER.

YEAR.	RAINFALL.				TEMPERATURE.										CLOUD.
	Total.		Max. Fall.	Falls of 1 in. or +	Dry. Mean, 9a.&9p.	Wet. Mean, 9a.&9p.	Shade Max		Shade Min		Sun Max. Black.		Grass Min.		
	Depth	Days					Abs.	Aver	Abs.	Aver	Abs.	Aver	Abs.	Aver	Aver
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	in.		in.		°	°	°	°	°	°	°	°	°	°	0–10
1858..	1·75	16	·60	0	40·7	39·4	52·5	44·5	24·4	34·6	..	..	..	..	7·2
1859..	2·24	18	·40	0	36·7	35·6	56·4	40·8	14·4	31·6	..	..	..	..	6·5
1860..	2·51	18	·64	0	36·1	35·1	53·5	40·5	6·7	32·1	..	..	1·8	27·7	6·5
1861..	1·45	11	·58	0	40·0	38·8	53·2	45·7	21·6	35·1	..	..	16·1	30·7	6·1
1862..	1·71	14	·33	0	43·4	41·6	54·6	47·0	30·3	38·5	..	..	24·2	34·9	6·2
1863..	1·31	10	·65	0	42·8	41·2	53·9	48·7	26·4	36·9	..	..	22·6	33·2	6·2
1864..	·36	8	·12	0	38·5	37·4	51·5	42·3	17·8	34·4	..	..	14·7	30·4	7·2
1865..	1·35	14	·42	0	42·8	41·2	52·5	46·5	30·8	38·5	..	..	26·7	35·4	6·8
1866..	2·63	16	·53	0	43·4	42·0	56·5	48·1	27·3	37·9	..	..	20·2	34·7	6·3
1867..	1·59	13	·52	0	38·2	37·0	54·9	42·3	22·5	32·5	..	..	14·8	28·7	6·5
1868..	5·12	27	·52	0	46·2	44·9	58·2	50·7	31·5	41·0	..	..	28·4	38·3	7·6
1869..	2·94	14	·65	0	38·2	36·9	57·7	43·3	20·8	33·3	..	..	17·2	29·5	6·4
1870..	3·07	18	·55	0	34·2	33·2	57·2	38·3	14·0	29·9	78·2	50·5	10·4	28·0	7·6
1871..	1·13	16	·41	0	38·3	37·4	49·0	42·7	20·1	34·2	71·3	55·3	19·1	30·6	6·9
1872..	4·35	22	·81	0	42·7	41·4	54·6	47·0	26·6	38·2	77·2	57·1	22·8	35·4	6·5
1873..	·48	8	·17	0	40·5	39·3	56·7	45·8	22·9	35·8	82·0	53·9	19·4	33·6	7·2
1874..	1·58	14	·52	0	33·3	32·6	53·8	38·1	18·4	28·7	74·4	49·8	15·8	27·4	6·7
1875..	·94	15	·26	0	39·0	38·1	54·8	42·9	23·2	34·8	71·9	53·4	20·7	32·6	7·7
1876..	6·25	23	1·61	1	44·2	43·0	56·6	47·8	28·0	40·4	77·0	53·7	25·4	37·4	8·1
1877..	1·51	17	·57	0	40·1	39·0	54·2	45·6	28·3	35·5	76·8	56·4	23·2	31·2	5·8
1878..	1·46	15	·26	0	33·7	33·0	55·2	38·2	18·7	29·5	72·4	46·7	12·2	26·6	7·1
1879..	·86	9	·32	0	32·6	31·9	53·4	37·7	16·1	26·9	68·2	45·0	7·8	23·4	7·3
1880..	3·17	18	·53	0	42·7	41·3	56·5	48·2	28·2	38·0	87·0	59·1	24·7	34·8	7·0
1881..	2·47	15	·71	0	39·9	38·7	53·6	44·7	28·1	35·1	72·3	52·7	21·2	30·2	6·7
1882..	2·51	16	·52	0	40·3	39·4	57·2	44·3	24·5	35·5	73·6	49·9	21·4	33·8	8·0
1883..	·75	14	·45	0	40·3	38·8	54·9	44·9	28·3	36·4	72·3	54·5	23·7	33·7	7·4
1884..	2·57	17	·41	0	40·8	39·2	55·7	45·9	28·5	36·6	66·7	51·5	22·2	33·0	7·2
1885..	1·05	11	·35	0	38·4	37·2	50·8	44·0	22·3	33·8	72·2	52·5	15·4	28·8	6·2
1886..	4·34	18	1·82	1	36·2	34·9	53·9	41·3	19·7	31·3	66·4	52·1	12·2	26·0	5·2
1887..	1·38	13	·30	0	37·8	36·4	53·8	42·8	24·3	33·2	74·7	52·8	19·2	28·7	6·7
1888..	1·29	9	·43	0	40·6	39·8	58·9	46·2	25·9	36·2	69·9	53·3	19·2	31·1	5·6
1889..	1·23	15	·29	0	37·8	37·0	53·2	43·0	22·8	33·2	59·2	47·1	17·1	28·7	6·9
1890..	·68	9	·21	0	30·3	29·6	43·7	34·0	14·9	25·5	49·3	36·9	5·5	22·0	8·1
1891..	3·24	18	·70	0	40·9	39·7	57·2	46·3	16·8	35·3	71·1	54·3	12·6	30·2	6·7
1892..	1·37	11	·44	0	36·2	35·2	54·5	41·4	16·7	31·4	66·2	48·8	12·1	26·8	5·9
1893..	2·23	14	·44	0	40·2	38·8	57·8	45·8	20·1	34·4	68·9	54·2	20·5	30·7	5·4
1894..	2·28	16	·93	0	41·8	40·2	52·1	46·7	26·3	36·4	69·6	54·2	24·6	33·1	6·1
1895..	2·19	16	·34	0	40·0	38·8	56·4	44·9	26·1	35·2	78·7	51·0	25·9	32·1	7·0
1896..	3·61	21	·75	0	40·1	38·9	51·8	44·5	26·6	34·3	61·1	49·9	20·8	28·8	7·4
1897..	2·20	17	·64	0	40·9	39·6	55·9	45·5	23·7	35·7	66·9	52·6	21·2	31·7	6·3
Mean ...	2·13	15	·54	0·1	39·3	38·1	54·5	44·0	22·9	34·4	71·3	51·8	18·5	30·9	6·8
Ex-tremes	6·25	27	1·82	1	46·2	44·9	58·9	50·7	31·5	41·0	87·0	59·1	28·4	38·3	8·1
	·36	8	·12	0	30·3	29·6	43·7	34·0	6·7	25·5	49·3	36·9	1·8	22·0	5·2

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1899.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, CamdenSquare	89·2	20	50·9	5	79·2	57·3	54·8	66	134·4	47·5	1·45	10	4·8
Malta	94·6	25	59·0	3	84·4	68·1	63·2	67	147·5	57·7	·00	0	0·6
Cape of Good Hope	81·1	27	42·5	25	65·5	48·2	46·6	78	...	...	4·25	9	2·7
Mauritius	75·5	23	59·4	23	73·6	63·9	59·0	73	144·4	51·9	2·93	24	5·3
Calcutta	93·2	1	75·6	27	88·5	78·3	78·3	87	154·2	75·8	21·47	26	8·8
Bombay	87·0	31	76·0	9	85·3	78·7	75·9	81	134·5	74·2	4·72	22	8·5
Ceylon, Colombo	89·2	22	76·2	2	87·4	77·9	73·5	79	148·0	72·5	1·11	7	5·2
Melbourne	61·0	12	30·6	20	55·5	38·8	41·3	82	118·8	25·2	1·29	8	5·1
Adelaide	68·1	29	35·6	27	58·0	39·9	39·4	74	126·4	25·4	·37	7	3·6
Sydney	61·7	15	39·8	2	57·7	46·3	42·9	80	106·0	32·0	3·96	20	4·4
Wellington	57·3	18	31·0	15*a*	50·5	39·6	36·4	72	105·0	23·0	6·45	21	4·7
Auckland	61·0	20	37·0	26	55·7	43·2	39·3	60	107·0	31·0	5·32	17	5·0
Trinidad	91·0	31	69·0	25	88·8	70·5	72·5	82	165·0	67·0	4·44	17	...
Grenada	86·4	26	71·2	1	83·9	74·7	71·2	78	154·2	...	6·67	29	2·8
Toronto	87·2	21	50·2	31	79·8	57·7	58·8	71	107·5	46·2	1·02	11	3·9
New Brunswick, Fredericton	87·7	2	42·3	1	74·6	54·4	55·5	67	...	...	6·28	16	6·0
Manitoba, Winnipeg	89·4	22	43·0	29	79·1	54·2	...	76	....	....	1·96	10	5·2
British Columbia, Esquimalt	...	...	...	...	...	...	..	...	...	...	...	...	...

a—and 26.

Remarks.

Malta.—Adopted mean temp. 75°·2, or 2°·2 below the average. Mean hourly velocity of wind 9·3 miles, or 1·7 above the average. Mean temp. of sea 77°·0. TS on 14th. L on 15th. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·1, and of dew point 0°·4 below, rainfall ·66 in. above, the average. Mean hourly velocity of wind 13·9 miles, or 2·0 above average; extremes, 29·6 on 8th and 2·7 on 3rd; prevailing direction, E.S.E. A. Walter.

Ceylon, Colombo.—Mean temp. of air 81°·7, or 1°·1 above, of dew point 0°·1 above, and rainfall 3·38 in. below, the average. Mean hourly velocity of wind 9·8 miles; prevailing direction S.W. TS on 4th. H. O. Barnard.

Adelaide.—Mean temp. 2°·6 below, and rainfall 2·27 in. below, the average of 42 years. The coldest, sunniest, driest, and calmest July on record. C. Todd, F.R.S.

Sydney.—Mean temp 0°·4 below; humidity 3·2 above; and rainfall ·32 in. below, the average. H. C. Russell, F.R.S.

Wellington.—Generally wet, with a few fine days at intervals. Prevailing S. and N.W. winds, generally moderate: some cold weather and frosty nights; light snow on 25th, and snow on the near hills. H on 5 days; fog on 4 days. Temp. 2°·6 below, and rainfall ·11 in. above, the average. R. B. Gore.

Auckland.—Cold and stormy most of the month. Mean temp. quite 2°·0 below the average. Rainfall slightly above the average. T. F. Cheeseman.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1899.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge, Harefield Pk..	1·34	XI.	Builth, Abergwesyn Vic.	5·03
II.	Dorking, Abinger Hall .	1·61	,,	Rhayader, Nantgwillt...	5·04
,,	Birchington, Thor	2·09	,,	Lake Vyrnwy	4·09
,,	Hailsham	2·40	,,	Corwen, Rhug	2·77
,,	Ryde, Thornbrough	1·68	,,	Criccieth, Talarvor	2·37
,,	Emsworth, Redlands ...	1·84	,,	I. of Anglesey, Lligwy..	3·08
,,	Alton, Ashdell	1·89	,,	I. of Man, Douglas	4·96
III.	Oxford, Magdalen Coll..	1·21	XII.	Stoneykirk, Ardwell Ho.	4·71
,,	Banbury, Bloxham	1·68	,,	New Galloway, Glenlee	5·31
,,	Northampton, Sedgebrook	1·53	,,	Monaive, Maxwelton Ho.	4·12
,,	Stamford, Duddington..	...	,,	Lilliesleaf, Riddell	2·60
,,	Alconbury	1·47	XIII.	N. Esk Res. [Penicuick]	3·35
,,	Wisbech, Bank House...	1·34	XIV.	Glasgow, Queen's Park..	2·69
IV.	Southend	1·47	XV.	Inverary, Newtown	6·06
,,	Harlow, Sheering..... ...	...	,,	Ballachulish, Ardsheal...	6·77
,,	Colchester, Lexden	1·37	,,	Islay, Gruinart School ...	2·00
,,	Rendlesham Hall	1·63	XVI.	Dollar.....	5·20
,,	Scole Rectory	1·38	,,	Balquhidder, Stronvar...	5·53
,,	Swaffham	1·66	,,	Coupar Angus Station...	4·10
V.	Salisbury, Alderbury ...	1·49	,,	Dalnaspidal H.R.S.....	...
,,	Bishop's Cannings	2·12	XVII.	Keith H.R.S.....	5·66
,,	Blandford, Whatcombe .	2·80	,,	Forres H.R.S.	4·59
,,	Ashburton, Holne Vic...	4·37	XVIII.	Fearn, Lower Pitkerrie..	2·81
,,	Okehampton, Oaklands.	5·37	,,	S. Uist, Askernish	7·03
,,	Hartland Abbey	3·67	,,	Invergarry.....	2·96
,,	Lynton, Glenthorne ...	4·89	,,	Aviemore H.R.S.	1·20
,,	Probus, Lamellyn	4·24	,,	Loch Ness, Drumnadrochit	3·15
,,	Wellington, The Avenue	3·95	XIX.	Invershin	3·65
,,	North Cadbury Rectory	2·80	,,	Durness.....	4·15
VI.	Clifton, Pembroke Road	3·41	,,	Watten H.R.S.....	3·86
,,	Ross, The Graig	2·62	XX.	Dunmanway, Coolkelure	16·36
,,	Wem, Clive Vicarage ...	2·01	,,	Cork, Wellesley Terrace	...
,,	Wolverhampton, Tettenhall	2·31	,,	Killarney, Woodlawn ..	9·72
,,	Cheadle, The Heath Ho.	2·78	,,	Caher, Duneske	7·03
,,	Coventry, Priory Row...	2·03	,,	Ballingarry, Hazelfort...	4·22
VII.	Grantham, Stainby	1·65	,,	Limerick, Kilcornan ...	4·36
,,	Horncastle, Bucknall ...	1·89	,,	Miltown Malbay	6·63
,,	Worksop, Hodsck Priory	2·33	XXI.	Gorey, Courtown House	3·97
VIII.	Neston, Hinderton	2·58	,,	Moynalty, Westland ...	5·39
,,	Southport, Hesketh Park	2·71	,,	Athlone, Twyford	5·28
,,	Chatburn, Middlewood.	3·38	,,	Mullingar, Belvedere ...	5·86
,,	Duddon Val., Seathwaite Vic.	8·15	XXII.	Woodlawn	5·55
IX.	Melmerby, Baldersby ...	2·93	,,	Crossmolina, Enniscoe..	7·87
,,	Scarborough, Observat'y	...	,,	Collooney, Markree Obs.	6·18
,,	Middleton, Mickleton ...	3·52	,,	Ballinamore, Lawderdale	...
X.	Haltwhistle, Unthank H.	2·71	XXIII.	Warrenpoint.....	7·40
,,	Bamburgh	3·61	,,	Seaforde.....	6·05
,,	Keswick, The Bank.....	3·12	,,	Belfast, Springfield	5·40
XI.	Llanfrechfa Grange	3·15	,,	Bushmills, Dundarave..	7·35
,,	Llandovery	3·05	,,	Stewartstown	5·32
,,	Castle Malgwyn	3·85	,,	Killybegs	6·68
,,	Brecknock, The Barracks	3·31	,,	Horn Head	5·80

DECEMBER, 1899.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Da
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·05	— 1·02	·22	1	17	55·3	6	21·8	1
II.		Tenterden ...	2·22	— ·41	·67	29	19	54·0	6	16·0	1
,,		Hartley Wintney ...	1·52	...	·29	29	20	55·0	6	12·0	1
III.		Hitchin ...	1·59	— ·44	·25	28	18	53·0	1, 6	15·0	1
,,		Winslow (Addington) ...	1·51	— ·94	·20	1, 29	16	55·0	6	11·0	1
IV.		Bury St. Edmunds (Westley)	1·48	— ·76	·34	5	12	52·0	1, 6	21·0	1
,,		Norwich (Brundall) ...	1·76	...	·33	5	19	53·2	1	13·0	1
V.		Winterbourne Steepleton ...	4·20	...	1·10	28	20	55·0	6	19·0	1
,,		Torquay (Cary Green)	4·16	...	1·15	28	21	55·8	6, 7	25·2	1
,,		Polapit Tamar [Launceston]..	3·57	— ·66	·81	28	20	56·9	6	17·7	1
VI.		Stroud (Upfield) ...	2·43	— ·02	·60	28	18	54·0	6	19·0	1
,,		ChurchStretton(Woolstaston)	2·10	— ·95	·51	29	19	53·0	1, 6	14·5	1
,,		Worcester (Diglis Lock) ...	2·73	+ ·75	·70	29	15	...	...	...	..
VII.		Boston ...	1·48	— ·37	·37	28	12	50·0	1,4,6	19·0	1
,,		Hesley Hall [Tickhill]...	2·23	+ ·25	·48	28	17	55·0	4	10·0	1
,,		Breadsall Priory ...	2·49	...	·51	28	12	...	...	...	..
VIII.		Manchester(PlymouthGrove)	2·68	— ·76	·35	29	15	54·0	4	18·0	1
IX.		Wetherby (Ribston Hall) ...	3·57	+ 1·13	1·05	28	18	...	...	...	..
,,		Skipton (Arncliffe) ...	4·91	— 1·90	·86	30	16	...	...	...	..
,,		Hull (Pearson Park).	2·52	+ ·25	·52	28	18	53·0	4, 5	19·0	1
X.		Newcastle (Town Moor) ...	3·50	+ 1·20	·95	28	17	...	...	...	..
,,		Borrowdale (Seathwaite)...	8·76	— 6·05	1·89	3	16	...	...	...	..
XI.	WALES.	Cardiff (Ely)...	3·43	— 1·12	·93	28	21	...	...	...	..
,,		Haverfordwest	4·42	— ·57	·82	28	21	56·0	6	23·8	1
,,		Aberystwith (Gogerddan) ...	3·58	— 1·30	1·18	4	15	55·0	6	...	..
,,		Llandudno...	2·61	— ·35	·42	4	17	56·5	6	24·5	1
XII.	SCOTLAND.	Cargen [Dumfries]	3·37	— ·65	·56	3	12	53·0	4	12·0	1
XIII.		Edinburgh (Blacket Place)...	2·13	...	·41	5	16	53·3	4	18·3	1
XIV.		Colmonell ...	5·30	...	·67	3	21	53·0	5	16·0	2
XV.		Tighnabruaich ...	6·88	...	1·20	19	17	48·0	3, 5	22·0	2
,,		Mull (Quinish)...	...	...	...	...	...	...	...	...	..
XVI.		Loch Leven Sluices ...	4·10	+ ·79	1·20	7	9	...	...	...	..
,,		Dundee (Eastern Necropolis)	4·60	+ 2·52	·90	6	19	55·7	4	14·9	1
XVII.		Braemar	3·06	+ ·59	·55	5	20	50·7	4	8·2	1
,,		Aberdeen (Cranford)	5·65	...	·95	6	27	55·0	3, 4	10·0	1
,,		Cawdor (Budgate) ...	4·14	+ 1·68	·78	4	19	...	...	...	..
XVIII		Strathconan [Beauly] ...	4·03	— 1·74	...	...	...	...	...	...	..
,,		Glencarron Lodge...	6·33	...	1·71	3	20	52·0	4	17·5	2
XIX.		Dunrobin ...	3·68	+ ·31	·74	30	18	...	...	...	..
,,		S. Ronaldshay (Roeberry) ...	4·83	+ 1·17	·88	15	24	52·0	3	26·0	2
XX.	IRELAND.	Darrynane Abbey...	8·16	...	1·35	19	28	...	...	...	..
,,		Waterford (Brook Lodge) ...	8·64	+ 5·00	1·66	28	22	55·0	6	21·5	2
,,		Broadford (Hurdlestown) ...	6·10	...	·86	13	28	...	...	...	..
XXI.		Carlow (Browne's Hill) ...	4·78	+ 1·66	·97	28	26	...	...	...	..
,,		Dublin (FitzWilliam Square)	3·29	+ 1·13	1·13	28	24	61·0	6	25·5	2
XXII.		Ballinasloe	3·59	+ ·17	·57	11	26	52·0	5, 6	23·0	2
,,		Clifden (Kylemore)	13·64	...	1·42	16	23	...	...	...	..
XXIII		Waringstown ...	4·94	+ 1·90	1·20	28	12	52·0	1	19·0	2
,,		Londonderry (Creggan Res.).	5·91	+ 1·70	·80	3	26	...	...	...	..
		Omagh (Edenfel) ...	4·99	+ 1·31	·75	19	18	53·0	5, 6	17·0	2

+ Shows that the fall was above the average; — that it was below it.

a—and 28. b—and 15.

METEOROLOGICAL NOTES ON DECEMBER, 1899.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The first week was showery, followed by 13 days of hard frost. One-and-a-half inches of S fell on the 11th. The water in the well was nearly as low as at the end of 1898, there being only 10 inches of water on 19th. The 25th and 31st were lovely days, but it was showery between, with a gale from S. on 29th. Fog on 4 days. Duration of sunshine 56 hours.

HARTLEY WINTNEY.—A cold, wintry month. The grass min. fell to 6° on the nights of 14th, 15th and 16th, and dense fogs occurred each day. From 20th to the end there were slight frosts nightly, with R during the days. S.W. gale on 29th and 30th. S on 11th and 12th. Ozone on 4 days, with a mean of 5. Duration of sunshine on 25th, 5 hours.

WINSLOW, ADDINGTON.—A dull, cold month, with several sharp frosts and very dense fogs. The least R in December since 1893. The 15th was intensely cold, the temp. not rising above 25°. Fog on 7th, 15th, 18th and 27th.

BURY ST. EDMUNDS, WESTLEY.—A cold month with very little S. S on 11th.

NORWICH, BRUNDALL.—The coldest December since 1892, but the absolute min. temp. was the same as in 1890, and the lowest since then. Mean 35°·9. Fog on 3 days. S on 10th, 11th and 14th.

WINTERBOURNE STEEPLETON.—A cold month, the mean temp. being only 37°·8, while for December, 1898, it was 45°·6. The greatest cold occurred in the week ending 16th, the mean for the week being only 31°·4. The last part of the month was squally, with very low pressure. Fog on 6th. T and L on 29th at 9 a.m. S on 11th.

TORQUAY, CARY GREEN.—R ·15 in. above the average. Mean temp. 42°·3, being 1°·0 below the average. Duration of sunshine 47 hours, being 8 hours 10 mins. below the average; 14 sunless days. Ozone, mean at 9 a.m., 4·9; greatest 8·5 on 26th, 29th and 30th; with S. and W. winds; least 0·5 on 19th and 20th, with N. and E. winds.

POLAPIT TAMAR [LAUNCESTON].—The first three weeks were comparatively dry and calm; the last ten days wet and stormy. S on 8th and 11th. T and L at 5.30 p.m. on 28th. S. gale on 29th.

CHURCH STRETTON, WOOLSTASTON.—A very cold month, with continued frost. S fell on 5 days. Mean temp. 34°·9.

WORCESTER, DIGLIS LOCK.—Four-and-a-half inches of S fell on 11th. Heavy S.E. gale on 29th.

HULL, PEARSON PARK.—Fog on 11 days. S on 8 days. H on 2 days.

SEATHWAITE.—S two-and-a-half inches deep on 12th; two inches on 26th.

WALES.

HAVERFORDWEST.—Generally mild and wet; the rainfall, though not large, being continuous. S on the ground only on 9th. The bar. (corr. and red.) read 28·263 in. at 2 p.m. on 29th, but was unaccompanied by any special feature except a distant peal of T and some L in the forenoon, with heavy R during the day and some soft H; on 28th the wind reached the force of a fresh gale. No lower reading of the bar. has occurred since 1886, when it fell to 28·209 in.

ABERYSTWITH, GOGERDDAN.—Low temp. throughout, and very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—S five inches deep on 12th, four inches deep on 22nd.

EDINBURGH, BLACKET PLACE.—Mean temp. 2°·4 below, and R 22 per cent. below the average. S on 10th, 11th, 22nd and 28th; about six inches deep on 11th. Bar. (cor. and red.) fell to 28·456 in. at 9 p.m. on 29th.

COLMONELL.—R ·17 in. above, and mean temp. 1°·2 below, the average of 23 years. S on 8th, 11th, 13th and 21st.

TIGHNABRUAICH, CRAIGANDARAICH.—A month of extremes. Very wet, windy, calm, frosty and snowy in rotation. Great thickness of cloud and darkness on 19th.

ABERDEEN, CRANFORD.—The month was cold and wet, with some light S showers from 11th to 15th, and wet S on 22nd and 23rd.

S. RONALDSHAY, ROEBERRY.—A cold, wet and windy month. Mean temp. 39°·9, being 1°·9 below the average of 9 years.

IRELAND.

DARRYNANE ABBEY.—The wettest month (except two, August and November, 1892) since January, 1890. A very heavy gale occurred on the night of 27th and morning of 28th, numbers of trees were blown down; wind N.E. and cold R mixed with wet S or sleet.

WATERFORD, BROOK LODGE.—The wettest December since 1876. T on 7th; T and L on 28th; S on 27th.

BROADFORD, HURDLESTOWN.—A very wet and severe month, being the wettest December, and (with the exception of August, 1891) the wettest month on record. R 2·73 in., and rainy days 6, above the average of 15 years. S.E. gale with S on 27th and 28th.

DUBLIN, FITZWILLIAM SQUARE.—An unsettled, dull and wet month, of medium temp. but presenting sharp and sudden extremes of warmth and cold. Mean temp. 42°·0 or 0°·7 above the average. Lunar halos on 10th and 15th. Solar halos on 2nd and 13th. High winds occurred on 7 days attaining the force of a gale on 3. Fog on 11 days. S and sleet on 28th, 30th and 31st.

BALLINASLOE.—Heavy S all day on 28th and S on 31st. L on 3rd. Thick fog on 9th.

EDENFEL [OMAGH].—The mild and wet weather with which the month commenced, gave way on the 12th to a week of fine, generally dry, weather with frosty nights. The next week was again humid, followed from Christmas to the end by some very sharp frost and heavy though temporary S, all of which disappeared in the gale of 30th.

END OF VOL. XXXIV.

FEB 8 - 1940